REAC

FINAL REPORT
KALAMAZOO RIVER MAMMAL STUDY
KALAMAZOO RIVER SITE
KALAMAZOO, MICHIGAN
MAY 1995

U.S. EPA Work Assignment No.: 0-0038
Weston Work Order No.: 03347-040-001-0038-01
U.S. EPA Contract No.: 68-C4-0022

OFFICE OF EMERGENCY AND REMEDIAL RESPONSE

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DATE: May 12, 1995

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THROUGH: Ralph M. Shapot, REAC Program Manager

FROM: Scott Grossman, REAC Task Leader

SUBJECT: DOCUMENT TRANSMITTAL UNDER WORK ASSIGNMENT 0-038

Attached please find the following document prepared under this work assignment:

FINAL REPORT
KALAMAZOO RIVER SITE
KALAMAZOO RIVER MAMMAL STUDY

cc: Central File - WA 0-038 (w/attachment)
REAC Program Manager (w/o attachment)

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FINAL REPORT
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U.S. EPA Work Assignment No.: 0-0038
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Prepared by:

Roy F. Weston, Inc.

FOR Paul Bovitz — 15 MAY 1995 Date
Task Leader

Ralph M. Shapot — 5/15/95 Date
Project Manager

Prepared for:

U.S. EPA/ERT

David W. Charters
Work Assignment Manager

Analytical activities for this project proceeded under direction of Tony LoSurdo, and dissection activities were coordinated by Matt Donohue.

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1.0 INTRODUCTION

1.1 Objectives of this Study

The objective of this project was to process and analyze muskrat (*Ondatra zibethicus*) and mink (*Mustela vison*) tissues collected by the State of Michigan Department of Natural Resources (DNR) on the Kalamazoo River in Michigan. The data will be used by the U.S. Environmental Protection Agency (EPA) Region V to evaluate potential impacts of PCB and metals contamination on the riverine food chain.

1.2 Site Background

Polychlorinated biphenyls (PCBs), metals, and polynuclear aromatic hydrocarbons have been historically discharged into the Kalamazoo River from a variety of industrial sources in the vicinity of Kalamazoo. These compounds have apparently migrated downstream; thus, a sixty-mile stretch of the Kalamazoo River located primarily south of Kalamazoo, Michigan was investigated.

2.0 METHODOLOGY

The State of Michigan DNR trapped muskrats and mink from selected locations along the Kalamazoo River potentially contaminated with PCBs and possibly metals, pesticides and semi-volatile organic compounds. Specimens were initially processed by an animal clinic contracted by Michigan DNR. Specimens were subsequently sent to the U.S. EPA/Environmental Response Team (ERT), and its Response Engineering and Analytical Contractor (REAC) for final processing, which included partial necropsies, removal of select tissues, specific chemical analyses on tissues and whole body, and subcontracted histopathological analyses.

2.1 Specimen Collection

From August 1993 through April 1994, Michigan DNR collected a total of 10 mink and 37 muskrat specimens from selected areas along the Kalamazoo River. Details regarding the specimen collection procedures are provided in Appendix A, Quality Assurance Work Plan (QAWP).

2.2 Initial Processing

Upon collection, initial metrics on each specimen were recorded in the field. These included total body weight, total length, tail length, and hind foot length. A field data sheet was completed for each specimen noting the date, trapping method, trapping area, species, metrics, and other pertinent data (Appendices B and C, Michigan DNR Specimen Field Data sheets, and ERT/REAC Specimen Data Sheets, respectively).

Specimens were transferred by Michigan DNR to a subcontracted animal clinic, which skinned each animal, conducted initial necropsies, and removed sections of tissue from the liver and right kidney of each specimen for histopathological analysis. The original weight of the liver and kidneys was recorded, and the weight of sections taken for histopathology was subsequently recorded. Each section weighed approximately 2 grams (2 g), and was preserved in a labeled 40 milliliter (ml) glass vial, filled with 4% buffered paraformaldehyde. Also, any parasites found in the body cavity were preserved in a separate vial.

The carcass and pelt of each specimen collected were shipped on wet ice to the REAC bioassessment laboratory for final processing and analysis. Several of these specimens arrived frozen; in such cases this was noted on the individual specimen data sheet.

2.3 Final Processing

All animal processing and dissections followed procedures detailed in the QAWP, as well as REAC Draft SOPs for Muskrat Trapping, and #2039, Small Mammal Dissection and Tissue Processing, Tissue Processing and Analysis (Appendix B).

Whole body specimens, pelts, and histology samples were received by the REAC sample custodian. Specimens were checked against their respective chain of custodies. Whole body specimens and pelts were immediately transferred to a freezer at <0°C. Histology samples were retained at 4°C until submission for analysis.

Final processing of whole body specimens in preparation for chemical analysis was completed within 24 hours after arrival at REAC. Final biological processing included:

(1) removing and weighing the liver, kidneys, adrenal glands, reproductive tracts, spleen, and thymus;

(2) removing and weighing contents of the gastrointestinal tract, and rinsing the tract with distilled water;

(3) returning all organs to the central body cavity (except liver and kidney);

(4) submitting the liver, kidney, and whole body tissues for homogenization and analysis;

(5) removal of the lower left jaw for aging by dentition.

Sample documentation and handling procedures followed U.S. EPA/REAC SOPs #2002, Sample Documentation and 2003, Sample Storage, Preservation, and Handling.

2.4 Chemistry

A summary of chemical analyses conducted on each tissue matrix is provided in Table 1. The carcass tissue refers to a homogenate of the entire animal, excluding the lower jaw, gastrointestinal contents, liver, and kidney.

2.5 Histopathology

Liver and kidney sections from each specimen were sent to the Virginia-Maryland Regional College of Veterinary Medicine, located at Virginia Polytechnic Institute, Blacksburg, VA. Slides and paraffin blocks were prepared, and tissues were interpreted by trained histopathologists. Parasites were also identified to the lowest practicable taxon.

2.6 Aging by Dentition

Specimens of each species were aged by dentition by a subcontracted laboratory (Matson's Laboratory, Milltown, MT.) using cementum annuli techniques. The lower left jaw of each specimen was provided to the laboratory, which then extracted the M1 molar for analysis for muskrat and the canine for mink.

3.0 RESULTS

3.1 Trapping and Metrics

The number of specimens received from the Michigan DNR is summarized in Table 2, by date and area trapped. Copies of data sheets completed by Michigan DNR personnel for each specimen are provided in Appendix C. Results of organ metrics, and copies of ERT/REAC data sheets completed during final processing are provided in Appendix D.

3.2 Chemistry

Analytical results for each species are presented by matrix, and analysis in Tables 3-18.

3.3 Histopathology

Histopathological investigation revealed no evidence of direct contaminant effects on the tissues submitted for analysis. A summary of the histopathological report is provided in Appendix E.

3.4 Aging by Dentition

The subcontracted laboratory report on cementum aging (Appendix F) identified 3 categories of certainty. These are:

A - result is nearly certain

B - some error possible; there is histological evidence to support the reported age; if error is present, it is within the age range reported.

C - error likely; there is little histological evidence to support the reported age.

The aging analysis of the mink (n = 10) by cementum annuli identified all mink as class A certainty. The mink ages ranged from less than a year old to less than five years old (Table 19).

The aging methods identified 12 of the muskrats with virtual certainty (A), 20 of the muskrat with some certainty (B), and 4 of the muskrats with little certainty (C). Table 20 summarizes the ages of the muskrat collected during the study.

4.0 DISCUSSION

At the request of the Work Assignment Manager, no data interpretation has been provided.

Tables

TABLE 1
ANALYTICAL SUMMARY
KALAMAZOO RIVER MAMMAL STUDY,
MAY 1995

Trapping Area	Date	Analysis	Muskrat				Mink		
			Carcass	Liver	Kidney	Pelt	Carcass	Liver	Kidney
BC	August 1993	Metals	5*	NA	6	5*	NA	NA	NA
		PCB/pest	5*	6	NA	5*	NA	NA	NA
		BNAs	5*	NA	NA	5*	NA	NA	NA
		Lipids	5*	6	6	5*	NA	NA	NA
		Moisture	5*	6	6	5*	NA	NA	NA
BG, OD, TB, PD, AD, Test	Dec-April 1994	Metals	31	NA	31	NA	10	NA	10
		PCB/pest	31	31	NA	NA	10	10	NA
		BNAs	31	NA	NA	NA	10	NA	NA
		Lipids	31	31	6	NA	10	10	NA
		Moisture	31	31	31	NA	10	10	10

* One additional animal within the August, 1993 group was analyzed as full body tissue (pelt included).

TABLE 2
TRAPPING RESULTS BY AREA AND SPECIES
KALAMAZOO RIVER MAMMAL STUDY[1]
MAY 1995

Trapping Area	Trapping Date	Muskrat	Mink
BC	August 1993	6	0
TEST	December 1994	1	NA
BG	December 1994	6	5
OD	January 1994	6	0
TB	February 1994	6	2
PD	March 1994	6	1
AD	March/April 1994	6	2
TOTAL		37	16

[1]All trapping conducted by the State of Michigan, Department of Natural Resources.

TABLE 3a
RESULTS OF METALS ANALYSIS OF MUSKRAT CARCASS TISSUE
AREA AD
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(based on dry weight)

Date	040594	040594	033094	033094	033094	033094
Location	AD500405	AD600506	AD160102	AD090103	AD240101	AD300104
Parameter	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg
Aluminum	9.9	14	8.3	6.9	7.3	6.6
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND
Barium	31	22	15	29	32	18
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND
Calcium	68000	74000	60000	68000	58000	47000
Chromium	ND	ND	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND
Copper	21	3.8	3.9	6.2	8.3	5.3
Iron	250	320	270	230	250	230
Lead	0.96	ND	ND	0.47	0.35	0.31
Magnesium	2100	2300	1900	1800	1800	1500
Manganese	7.8	18	7	1.9	16	6.1
Mercury	ND	ND	ND	ND	ND	ND
Nickel	4.5	ND	ND	3.4	3	14
Potassium	9500	11000	11000	8300	9900	9300
Selenium	0.44	ND	ND	0.37	0.5	0.33
Silver	ND	ND	3.7	0.47	ND	ND
Sodium	4600	5000	4300	4500	4800	3800
Thallium	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND
Zinc	100	89	86	81	94	78

ND denotes Not Detected

TABLE 3b
RESULTS OF METALS ANALYSIS OF MUSKRAT CARCASS TISSUE
AREA PD
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(based on dry weight)

Date Location	031494 PD240205	031494 PD180203	031494 PD110206	031494 PD070204	031494 PD060201	031494 PD220202
Parameter	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg
Aluminum	ND	ND	ND	ND	ND	ND
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND
Barium	18	21	24	23	19	23
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND
Calcium	69000	69000	65000	78000	76000	73000
Chromium	ND	0.5	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND
Copper	3.8	5.5	3.1	4	5.6	6.6
Iron	210	320	280	390	250	300
Lead	ND	ND	ND	0.4	ND	ND
Magnesium	2200	2100	1900	2300	2200	2200
Manganese	3.6	8.7	11	6.5	6.2	4.6
Mercury	ND	ND	ND	ND	ND	ND
Nickel	ND	ND	ND	12	ND	ND
Potassium	10000	9200	8900	10000	10000	12000
Selenium	ND	0.4	ND	0.4	0.4	0.4
Silver	ND	ND	ND	ND	ND	ND
Sodium	4600	4800	5300	5300	5000	5500
Thallium	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND
Zinc	83	88	82	92	89	100

ND denotes Not Detected

TABLE 3c
RESULTS OF METALS ANALYSIS OF MUSKRAT CARCASS TISSUE
AREA TB
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(based on dry weight)

Date	021794	021694	021694	021694	021594	021594
Location	TB160406	TB290304	TB250305	TB320303	TB060202	TB160201
Parameter	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg
Aluminum	ND	14	ND	ND	ND	ND
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND
Barium	21	17	23	22	20	23
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	ND	0.96	ND	0.05	0.07	ND
Calcium	58000	61000	58000	97000	56000	58000
Chromium	ND	ND	ND	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND
Copper	5.7	6.9	4.3	8.9	4.2	60
Iron	280	260	270	290	350	240
Lead	0.5	8.4	ND	5.2	1	ND
Magnesium	1600	1900	1700	2600	1800	1700
Manganese	2.9	0.4	3.7	2.3	6.2	2.7
Mercury	0.3	ND	0.2	ND	ND	0.2
Nickel	ND	ND	ND	ND	ND	ND
Potassium	7600	11000	7700	8300	8400	7100
Selenium	0.4	0.8	1	1	0.5	0.7
Silver	ND	ND	ND	ND	ND	ND
Sodium	3900	4400	4600	5500	4400	4200
Thallium	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND
Zinc	79	100	84	110	96	110

ND denotes Not Detected

TABLE 3d
RESULTS OF METALS ANALYSIS OF MUSKRAT CARCASS TISSUE
AREA OD
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(based on dry weight)

Date Location	012794 OD020102	012694 OD040103	012694 OD170101	012794 OD140204	012794 OD010206	012794 OD120205
Parameter	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg
Aluminum	16	41	19	ND	ND	18
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND
Barium	46	33	73	21	28	28
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	0.06	0.08	ND	ND	ND	ND
Calcium	100000	76000	150000	37000	59000	120000
Chromium	ND	ND	2.3	ND	ND	1
Cobalt	ND	ND	ND	ND	ND	ND
Copper	22	14	46	4.2	4.3	28
Iron	260	340	480	200	270	300
Lead	5	7.8	ND	0.3	0.7	4.4
Magnesium	2600	2100	4300	1200	1800	2600
Manganese	2.6	9.1	3.1	2	2.3	5.5
Mercury	ND	ND	ND	ND	ND	ND
Nickel	15	2.3	ND	ND	ND	ND
Potassium	9200	9200	17000	7000	9500	8600
Selenium	0.7	ND	ND	ND	0.8	0.8
Silver	ND	ND	ND	ND	ND	ND
Sodium	5800	5800	8500	2900	4600	6200
Thallium	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND
Zinc	130	130	200	61	86	130

ND denotes Not Detected

TABLE 3e
RESULTS OF METALS ANALYSIS OF MUSKRAT CARCASS TISSUE
AREA BG
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(based on dry weight)

Date Location	121093 BG360306	121093 BG370307	121093 BG210305	121093 BG140304	121093 BG27A0302	121093 BG130303
Parameter	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg
Aluminum	ND	15	17	ND	ND	ND
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND
Barium	17	16	15	15	10	31
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	0.05	0.11	ND	0.06	ND	ND
Calcium	67000	54000	45000	47000	52000	50000
Chromium	0.75	0.64	0.45	0.58	ND	0.42
Cobalt	ND	ND	ND	ND	ND	ND
Copper	7.1	19	4.5	20	2.5	2.5
Iron	300	640	330	220	230	230
Lead	0.47	1	0.47	1.1	0.45	ND
Magnesium	2000	2000	1600	1300	1500	1400
Manganese	16	66	59	59	4.3	16
Mercury	ND	ND	ND	ND	ND	ND
Nickel	ND	ND	ND	ND	ND	ND
Potassium	9500	12000	11000	6900	7100	8200
Selenium	ND	ND	ND	ND	ND	ND
Silver	ND	ND	ND	ND	ND	ND
Sodium	4200	5000	4900	3100	3400	3900
Thallium	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND
Zinc	86	94	80	73	59	73

ND denotes Not Detected

TABLE 3f
RESULTS OF METALS ANALYSIS OF MUSKRAT CARCASS TISSUE
AREA BC
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(based on dry weight)

Date	081293	081193	081293	081293	081093	081193
Location:	BC270305	BC370202	BC380306	BC210304	BC210101	BC380203
Parameter	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg
Aluminum	19	49	26	13	11	45
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	0.58	ND	ND	0.57
Barium	20	24	21	19	25	15
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	0.07	0.074	0.049	ND	ND	0.061
Calcium	70000	74000	80000	81000	88000	53000
Chromium	0.61	1.2	1.5	0.56	ND	0.57
Cobalt	ND	ND	ND	ND	ND	ND
Copper	6.1	14	27	13	5.9	57
Iron	300	360	490	220	240	570
Lead	ND	ND	ND	ND	ND	2.4
Magnesium	2500	2400	2700	2500	2400	1900
Manganese	36	29	88	23	7.7	40
Mercury	ND	0.23	0.26	ND	0.23	ND
Nickel	ND	ND	ND	ND	ND	5.7
Potassium	13000	11000	13000	11000	11000	11000
Selenium	ND	ND	ND	ND	ND	ND
Silver	ND	0.33	ND	ND	0.35	ND
Sodium	6600	6100	6200	6000	5500	4900
Thallium	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND
Zinc	92	110	110	100	100	120

ND - denotes Not Detected

TABLE 4a
RESULTS OF METALS ANALYSIS OF MUSKRAT KIDNEY TISSUE
AREA AD
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(based on dry weight)

Date	040494	040594	033094	033094	033094	033094
Location	AD500405	AD600506	AD160102	AD090103	AD240101	AD300104
Parameter	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg
Aluminum	ND	22	ND	ND	ND	ND
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND
Barium	0.45	0.32	0.7	0.5	0.7	ND
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	0.22	0.27	0.14	0.41	0.17	0.48
Calcium	560	360	360	340	1100	420
Chromium	ND	1.1	3.6	2.7	ND	1.9
Cobalt	ND	3.9	ND	ND	ND	ND
Copper	15	1000	17	23	15	25
Iron	290	510	640	530	420	490
Lead	2.5	ND	ND	ND	ND	0.9
Magnesium	720	680	810	890	830	830
Manganese	7.2	7.8	7.6	6.6	8.8	9.8
Mercury	0.14	ND	ND	ND	ND	ND
Nickel	ND	8400	ND	33	ND	3.4
Potassium	11000	13000	12000	14000	13000	14000
Selenium	3.3	3.5	2.7	3.3	4.5	3.4
Silver	ND	1.6	7	0.54	ND	0.66
Sodium	5500	7400	7700	6200	5900	5300
Thallium	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND
Zinc	71	570	93	100	90	100

ND denotes Not Detected

TABLE 4b
RESULTS OF METALS ANALYSIS OF MUSKRAT KIDNEY TISSUE
AREA PD
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(based on dry weight)

Date Location	031494 PD240205	031494 PD180203	031494 PD110206	031494 PD070204	031494 PD060201	031494 PD220202
Parameter	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg
Aluminum	ND	ND	ND	ND	ND	ND
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND
Barium	0.4	0.5	0.3	0.5	0.3	0.3
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	0.2	3	1.5	1.6	1.2	1.7
Calcium	330	490	500	360	360	320
Chromium	ND	2	2.2	ND	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND
Copper	15	15	19	15	15	16
Iron	390	400	430	530	530	320
Lead	ND	ND	ND	ND	ND	ND
Magnesium	800	730	870	780	860	860
Manganese	6.3	6.4	8.9	5.2	7.1	7
Mercury	ND	ND	ND	0.3	ND	0.3
Nickel	ND	ND	ND	ND	ND	ND
Potassium	12000	10000	15000	11000	13000	13000
Selenium	3.8	5	3.4	4.3	3.1	4.4
Silver	ND	ND	ND	ND	ND	ND
Sodium	7400	6000	9700	6700	6900	6000
Thallium	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND
Zinc	91	81	95	93	93	91

ND denotes Not Detected

TABLE 4c
RESULTS OF METALS ANALYSIS OF MUSKRAT KIDNEY TISSUE
AREA TB
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(based on dry weight)

Date	021794	021694	021694	021694	021594	021594
Location	TB160406	TB290304	TB250305	TB320303	TB060202	TB160201
Parameter	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg
Aluminum	ND	17	ND	ND	ND	ND
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND
Barium	0.3	ND	ND	ND	0.4	0.3
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	2.1	5	2.2	3.9	2.2	0.7
Calcium	420	380	820	340	440	440
Chromium	1.3	1	ND	2.6	ND	1.3
Cobalt	ND	ND	ND	ND	ND	ND
Copper	13	18	21	24	17	16
Iron	620	540	550	620	730	680
Lead	1.4	4.6	59	5.5	3	1.6
Magnesium	700	730	940	710	820	790
Manganese	4.5	4.2	4.4	7.5	7.4	5.3
Mercury	2.9	0.2	0.1	ND	0.3	2.9
Nickel	ND	ND	ND	ND	ND	ND
Potassium	14000	12000	12000	10000	12000	13000
Selenium	3.6	4.3	6	5.6	5	4.4
Silver	ND	ND	ND	ND	ND	ND
Sodium	7100	6100	6500	6300	6200	5900
Thallium	ND	ND	ND	6.6	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND
Zinc	87	82	94	90	110	87

ND denotes Not Detected

TABLE 4d
RESULTS OF METALS ANALYSIS OF MUSKRAT KIDNEY TISSUE
AREA OD
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(based on dry weight)

Date	012694	012694	012694	012794	012794	012794
Location	OD020102	OD040103	OD170101	OD140204	OD010206	OD120205
Parameter	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg
Aluminum	ND	ND	ND	ND	ND	ND
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND
Barium	0.3	ND	0.3	0.5	0.3	0.7
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	3.6	1.9	0.8	1	1.1	7.2
Calcium	400	330	320	450	490	490
Chromium	2.2	1.6	0.8	ND	4.4	9.8
Cobalt	ND	ND	ND	ND	ND	ND
Copper	62	72	51	14	14	25
Iron	580	400	530	340	520	600
Lead	7.2	11	1.4	ND	1.9	2.3
Magnesium	770	680	710	840	830	800
Manganese	4.7	4.7	3.6	4.2	6.6	4.8
Mercury	ND	ND	ND	0.2	ND	ND
Nickel	ND	4.2	ND	ND	ND	4.5
Potassium	11000	8800	9900	14000	13000	11000
Selenium	3.4	2.5	3.4	4.7	4	3.4
Silver	ND	ND	ND	ND	ND	ND
Sodium	6900	4200	4200	7400	5700	7600
Thallium	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND
Zinc	120	120	100	110	90	110

ND denotes Not Detected

TABLE 4e
RESULTS OF METALS ANALYSIS OF MUSKRAT KIDNEY TISSUE
AREA BG
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(based on dry weight)

Date	121093	121093	121093	121093	121093	121093
Location	BG360306	BG370307	BG210305	BG140304	BG27A030	BG130303
Parameter	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg
Aluminum	ND	ND	ND	ND	ND	ND
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND
Barium	ND	0.54	0.35	0.42	0.24	ND
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	1.1	2.2	0.5	0.6	0.4	0.3
Calcium	500	780	380	480	260	230
Chromium	2.1	ND	ND	ND	ND	2.8
Cobalt	ND	ND	ND	ND	ND	ND
Copper	21	61	17	15	51	9.9
Iron	720	360	390	460	250	240
Lead	ND	2.8	ND	ND	2.0	ND
Magnesium	1200	700	670	900	410	500
Manganese	10	9.7	9.3	17	5.8	4.5
Mercury	ND	ND	ND	ND	ND	ND
Nickel	ND	23	ND	ND	ND	ND
Potassium	19000	10000	9700	12000	6600	6500
Selenium	4.3	3.2	2	3.2	1.7	1.3
Silver	ND	ND	ND	ND	ND	ND
Sodium	13000	7200	5700	7300	4400	5600
Thallium	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND
Zinc	130	95	71	96	64	54

ND denotes Not Detected

TABLE 4f
RESULTS OF METALS ANALYSIS IN MUSKRAT KIDNEY TISSUE
AREA BC
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(based on dry weight)

Date	081093	081193	081193	081293	081293	081293
Location:	BC210101	BC370202	BC380203	BC210304	BC380306	BC270305
Parameter	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg
Aluminum	ND	32	16	27	ND	ND
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND
Barium	ND	ND	0.83	ND	ND	ND
Beryllium	ND	ND	ND	ND	ND	ND
Cadmium	0.62	0.88	0.089	0.33	0.13	0.22
Calcium	440	590	710	560	360	530
Chromium	ND	1	ND	1.9	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND
Copper	33	16	59	60	23	15
Iron	530	490	490	370	310	440
Lead	ND	ND	6.5	3.1	ND	ND
Magnesium	910	930	1100	860	590	970
Manganese	9.6	8.3	16	14	10	9.3
Mercury	ND	0.4	ND	ND	ND	ND
Nickel	ND	ND	45	27	ND	ND
Potassium	14000	14000	13000	12000	6900	11000
Selenium	3.8	2.6	ND	3.7	ND	ND
Silver	ND	ND	ND	0.73	ND	ND
Sodium	6700	6800	10000	5600	5900	6600
Thallium	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND
Zinc	110	88	120	110	74	88

ND-denotes Not Detected

TABLE 5
RESULTS OF METALS ANALYSIS OF MINK CARCASS TISSUE
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(based on dry weight)

Date	042694	040794	031994	021794	021694	122193	121493	121393	120993	121093
Location	AD060210	AD160501	PD360701	TB110402	TB110301	BG471205	BG340804	BG540502	BG610703	BG470401
Parameter	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg
Aluminum	10	13	14	ND	ND	ND	ND	9.1	ND	ND
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.6
Barium	6.8	3.9	6	4.3	2.7	2.3	3.6	4.8	4.6	4.3
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	ND	0.10	ND	ND	ND	0.03	0.04	ND
Calcium	72000	51000	71000	52000	25000	28000	34000	51000	53000	56000
Chromium	ND	ND	ND	1.4	ND	ND	ND	ND	ND	2.3
Cobalt	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	7.6	15	14	5.4	6.7	15	5.9	8.4	14	8.4
Iron	340	290	220	190	220	260	210	240	230	360
Lead	0.60	ND	2.4	2.1	0.8	ND	ND	ND	ND	ND
Magnesium	1600	1500	1600	1300	960	1200	1100	1300	1400	1700
Manganese	1.9	3.3	1.2	ND	ND	3	1.1	2.7	2	4.1
Mercury	1.5	0.79	2	1	2.8	0.54	1.1	0.72	0.5	0.41
Nickel	19	3	ND	ND	ND	ND	ND	ND	ND	ND
Potassium	9500	10000	8600	8200	8100	11000	8600	8300	8400	12000
Selenium	ND	ND	0.53	ND	ND	ND	0.47	0.34	0.46	ND
Silver	ND	6.4	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	5400	4700	5100	3700	3200	4300	3600	4000	4500	6200
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	160	130	130	120	99	130	120	130	120	180

ND denotes Not Detected

TABLE 6
RESULTS OF METALS ANALYSIS OF MINK KIDNEY TISSUE
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(based on dry weight)

Date	042694	040794	031994	021794	021694	122193	121493	121393	120993	121093
Location	AD060210	AD160501	PD360701	TB110402	TB110301	BG471205	BG340804	BG470401	BG610703	BG540502
Parameter	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg	Conc mg/kg
Aluminum	ND	ND	ND	ND	ND	12	ND	ND	ND	ND
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Barium	ND	ND	0.53	0.1	ND	ND	0.31	ND	ND	ND
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	1.6	0.61	2.6	0.5	6	0.86	0.77	1.6	0.6	2.1
Calcium	280	230	420	230	310	250	420	320	260	330
Chromium	ND	3.1	2.7	ND	ND	0.93	2.8	1.2	ND	ND
Cobalt	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	23	21	45	27	22	34	26	15	94	190
Iron	710	930	520	1400	590	570	1300	360	510	770
Lead	ND	ND	2	2.1	2.4	0.4	ND	ND	4	7.9
Magnesium	760	640	630	560	620	530	950	500	480	480
Manganese	4.1	7	4.7	8.3	3.6	3.8	5.5	3.1	2.7	3
Mercury	4.1	2.2	7.5	2.5	8.1	1.1	2.6	0.67	1.1	1.2
Nickel	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Potassium	11000	9000	9100	5100	8100	7300	13000	6600	7200	5700
Selenium	5.5	5.1	6.3	1.2	4.7	3.3	4.4	3.1	3.5	3.4
Silver	ND	7.3	2.9	ND	ND	ND	ND	ND	ND	ND
Sodium	8500	6800	9200	6200	6700	7000	8100	7200	6900	4800
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	120	100	99	100	100	95	160	65	110	180

ND denotes Not Detected

TABLE 7
AROCLOR 1260 CONCENTRATIONS IN MUSKRAT CARCASS AND LIVER TISSUE
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(Results in µg/kg dry weight)

Collection Date	Location	Carcass Concentration	Carcass Lipids (%)	Liver Concentration	Liver Lipids (%)
08/10/93	BC210101	ND	9.3	ND	18.7
08/11/93	BC370202	ND	4.3	ND	15.6
08/11/93	BC380203	ND	4.6	ND	13.3
08/12/93	BC210304	ND	5.8	ND	15.7
08/12/93	BC270305	ND	4.8	ND	14.2
08/12/93	BC380306	ND	6.2	ND	15.5
12/08/93	BG370307	ND	15.2	ND	10.9
12/10/93	BG27A0302	ND	10.4	ND	20.8
12/10/93	BG130303	ND	24.8	ND	16.6
12/10/93	BG140304	ND	38.9	ND	16.1
12/10/93	BG210305	ND	10.1	ND	14.8
12/10/93	BG360306	ND	18.8	ND	8.9
01/26/94	OD020102	540	5.9	1000	11.6
01/26/94	OD170101	450	52.8	96	11.9
01/26/94	OD040103	370	11.8	310	12.2
01/27/94	OD010206	160	16.3	120	16.7
01/27/94	OD120205	210	7.8	310	13.0
01/27/94	OD140204	140	42.5	320	17.2
02/15/94	TB160201	2800	21.8	3800	14.8
02/16/94	TB250305	300	9.0	500	12.0
02/16/94	TB290304	860	9.8	1400	12.1
02/16/94	TB320303	280	5.6	1500	7.9
02/17/94	TB160406	8400	41.2	NA	NA
03/14/94	TB060202	290	12.9	230	11.4

NA - No analytical results since tissues could not be extracted.
ND - Denotes Not Detected

TABLE 7 (Continued)
AROCLOR 1260 CONCENTRATIONS IN MUSKRAT CARCASS AND LIVER TISSUE
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(Results in µg/kg wet weight)

Collection Date	Location	Carcass	Carcass Lipids (%)	Liver	Liver Lipids (%)
03/14/94	PD060201	1400	9.4	2600	13.2
03/14/94	PD110206	610	19.3	870	13.6
03/14/94	PD180203	530	21.0	420	14.0
03/14/94	PD220202	1400	14.9	1700	14.7
03/14/94	PD070204	2000	10.6	980	4.6
03/14/94	PD240205	81 J	18.4	120	14.7
03/30/94	AD090103	1900	20.4	1200	16.1
04/04/94	AD500405	1900	13.4	1500	18.2
04/05/94	AD600506	280	10.2	670	15.8
03/30/94	AD240101	2300	10.6	1900	16.9
03/30/94	AD160102	ND	6.8	330	17.1
03/30/94	AD300104	3100	18.2	1700	13.5

ND - Denotes Not Detected

TABLE 8
AROCLOR 1260 CONCENTRATIONS IN MINK CARCASS AND LIVER TISSUE
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(Results in µg/kg dry weight)

Collection Date	Location	Carcass Concentration	Carcass Lipids (%)	Liver Concentration	Liver Lipids (%)
12/09/93	BG470401	3000	24.9	1200	15.1
12/10/93	BG540502	6500	58.7	3300	15.5
12/13/93	BG610703	1900	17.4	1700	29.2
12/14/93	BG340804	3000	23.0	6000	43.2
12/21/93	BG471205	2500	41.1	3300	19.8
03/19/94	PD360701	7600	14.4	11000	21.5
02/16/94	TB110301	16000	30.9	7500	14.1
02/17/94	TB110402	11000	26.1	NA	NA
04/07/94	AD160501	5200	15.8	8900	21.9
04/26/94	AD060210	12000	7.0	52000	21.7

NA - No analytical results since tissues could not be extracted.

TABLE 9
DIELDRIN AND P,P' DDE RESULTS FOR MUSKRATS
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(Concentration in ug/kg,dry weight)

DATE	LOCATION	DIELDRIN		P,P' DDE	
		LIVER	CARCASS	LIVER	CARCASS
08/11/93	BC380203	ND	ND	ND	ND
08/10/93	BC210101	ND	ND	ND	ND
08/11/93	BC370202	7J	ND	ND	ND
08/12/93	BC210304	7.1J	4.2J	ND	ND
08/12/93	BC270305	8.0J	ND	ND	ND
08/12/93	BC380306	ND	ND	ND	ND
01/27/94	OD120205	ND	ND	ND	ND
01/27/94	OD010206	13J	ND	ND	ND
01/27/94	OD140204	ND	ND	ND	34
01/26/94	OD020102	ND	ND	ND	ND
01/26/94	OD170101	ND	ND	ND	ND
01/26/94	OD040103	ND	ND	ND	ND
12/08/93	BG370307	ND	ND	ND	ND
12/08/93	BG210305	29	ND	13J	ND
12/08/93	BG360306	ND	ND	ND	ND
12/08/93	BG140304	ND	ND	ND	10
12/08/93	BG130303	ND	ND	ND	ND
12/08/93	BG27A0302	ND	ND	ND	ND
02/16/94	TB320303	8.0J	ND	ND	ND
02/16/94	TB290304	ND	ND	ND	ND
02/16/94	TB250305	ND	ND	ND	ND
02/15/94	TB160201	57	ND	41	210
02/15/94	TB060202	ND	ND	ND	ND
02/17/94	TB160406	NA	ND	NA	330
03/14/94	PD110206	14J	ND	ND	10J
03/14/94	PD070204	ND	ND	8.7J	58
03/14/94	PD180203	14J	ND	ND	20
03/14/94	PD220202	57	11J	17	26
03/14/94	PD060201	74	13J	30	21

NA : Results lost during extractions
ND : Denotes not detected

TABLE 9 (cont'd)
DIELDRIN AND P,P' DDE RESULTS FOR MINK
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(Concentration in ug/kg,dry weight)

DATE	LOCATION	DIELDRIN		P,P' DDE	
		LIVER	CARCASS	LIVER	CARCASS
03/30/94	AD160102	4.2J	ND	ND	ND
03/30/94	AD090103	ND	ND	11J	31
03/30/94	AD240101	7.3J	ND	ND	ND
03/30/94	AD300104	11J	ND	10J	19
04/05/94	AD600506	14J	ND	28	7.0J
04/04/94	AD500405	11J	ND	7.4J	8.1J
12/14/93	BG340804	53	ND	510	150
12/09/93	BG470401	ND	37	140	120
12/10/93	BG540502	ND	ND	450	310
12/13/93	BG610703	71	ND	98	110
12/17/93	BG471205	ND	ND	460	200
03/19/94	PD360701	290	ND	43	23
02/16/94	TB110301	290	ND	79	480
02/17/94	TB110402	NA	ND	NA	560
04/26/94	AD060210	64	ND	62	13J
04/07/94	AD160501	ND	ND	59	26

NA : Results lost during extractions
ND : Denotes not detected

TABLE 10
SUMMARY OF DETECTED BNA COMPOUNDS IN MUSKRAT CARCASS TISSUE
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(Concentrations in µg/kg dry weight)

DATE	LOCATION	DIETHYLPHTHALATE	4-METHYLPHENOL	DI-N-BUTYLPHTHALATE	BIS(2-ETHYLHEXYL) PHTHALATE
8/10/93	BC210101	13.9*	ND	7.8*	ND
8/11/93	BC370202	1(J)*	9.5	12.6*	1.5(J)*
8/11/93	BC380203	4.4(J)*	16.1	9.9*	2.7(J)*
8/12/93	BC210304	1.2(J)*	19.6	21.5*	2.1(J)*
8/12/93	BC380306	1.6(J)*	34.5*	19.8*	2.7(J)*
12/8/93	BG130303	4346*	664(J)	36081*	ND
12/8/93	BG370307	11984*	5072	45283*	1597(J)
12/8/93	BG210305	4198*	2024(J)	42503*	2208(J)
12/8/93	BG360306	21176*	10303	45119*	ND
12/8/93	BG140304	5091*	2098(J)	44886(E)	ND
12/8/93	BG27A030	3133*	ND	8137*	4097
1/26/94	OD020102	3377(J)*	ND	16920*	2910(J)
1/26/94	OD170101	11944*	ND	ND	ND
1/26/94	OD040103	3732*	ND	ND	ND
1/27/94	OD120205	1605(J)*	ND	20215*	ND
1/27/94	OD140204	2659(J)*	ND	29186*	ND
1/27/94	OD010206	2024(J)*	ND	26248	ND

(J)- Indicates compound concentration found below method detection limit
ND- Indicates compound not detected
(E)- Indicates compound above Calibration Range
*- Indicates compound found in Method Blank

TABLE 10 (Continued)
SUMMARY OF DETECTED BNA COMPOUNDS IN MUSKRAT CARCASS TISSUE
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(Concentrations in µg/kg dry weight)

DATE	LOCATION	DIETHYLPHTHALATE	4-METHYLPHENOL	DI-N-BUTYLPHTHALATE	BIS(2-ETHYLHEXYL) PHTHALATE
2/15/94	TB060202	2539(J)	ND	27909*	1646(J)
2/15/94	TB160201	6853	ND	13268*	ND
2/16/94	TB290304	694(J)	3583(J)	36220*	ND
2/16/94	TB250305	9343	2984(J)	42354*	ND
2/16/94	TB320303	1524(J)	7225	26050*	ND
2/17/94	TB160406	3775	9571	18282*	ND
3/14/94	PD070204	2361(J)*	ND	10185*	ND
3/14/94	PD220202	10195*	718(J)	20389*	ND
3/14/94	PD180203	4129*	2109(J)*	13257*	ND
3/14/94	PD110206	ND	ND	37129*	ND
3/14/94	PD060201	15906*	1367(J)	108210*	ND
3/14/94	PD240205	1430(J)*	ND	12238*	ND
3/30/94	AD160102	35153	15871	11942*	ND
3/30/94	AD090103	3110	ND	13560*	ND
3/30/94	AD240101	6792	1830(J)	ND	ND
3/30/94	AD300104	5735	740(J)	22453*	1103(J)*
4/4/94	AD500405	ND	3217	12786*	ND
4/5/94	AD600506	ND	ND	15671*	ND

(J)- Indicates compound concentration found below method detection limit
ND- Indicates compound not detected
*- Indicates compound found in Method Blank

TABLE 11
SUMMARY OF BNA COMPOUNDS DETECTED IN MUSKRAT PELT TISSUE
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(Concentrations in µg/kg Dry weight)

DATE	LOCATION	DIETHYLPTHALATE	4-METHYLPHENOL	DI-N-BUTYLPHTHATLATE	BIS(2-ETHYLHEXYL) PHTHALATE
8/10/93	BC210101	3700(J)*	ND	12900*	1900(J)*
8/11/93	BC370202	4300(J)*	3100(J)	23900*	10400*
8/12/93	BC210304	4800(J)*	9400	10600*	10300*
8/12/93	BC270305	4000(J)*	ND	11600*	14800*
8/12/93	BC380306	2700(J)*	10300	19200*	26300*

(J)Indicates compound concetration found below method detection limit
ND-Indicates compound not detected
*-Indicates compound found in blank

TABLE 12
SUMMARY OF DETECTED BNA COMPOUNDS IN MINK CARCASS TISSUE
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

(Concentrations in µg/kg dry weight)

DATE	LOCATION	DIETHYLPTHALATE	4-METHYLPHENOL	DI-N-BUTYLPHTHATLATE	BIS(2-ETHYLHEXYL) PHTHALATE
12/10/93	BG540502	19646*	ND	45843	ND
12/13/93	BG610703	44219*	ND	19063*	727(J)*
12/14/93	BG340804	17505*	ND	ND	3958
12/21/93	BG471205	5019*	ND	ND	2346(J)*
2/16/94	TB110301	ND	ND	18677*	ND
2/17/94	BT110402	23483	ND	18900	ND
3/19/94	PD360701	23572	ND	5981*	ND

(J)Indicates compound concetration found below method detection limit
ND-Indicates compound not detected
*-Indicates compound found in blank

TABLE 13
RESULTS OF MOISTURE ANALYSIS FOR MUSKRAT CARCASS TISSUE
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

DATE	LOCATION	PERCENT MOISTURE
8/12/93	BC270305	77
8/12/93	BC380306	77
8/10/93	BC210101	73
8/11/93	BC370202	76
8/11/93	BC380203	76 *
8/12/93	BC210304	75
12/10/93	BG370307	73
12/10/93	BG210305	72
12/10/93	BG360306	67
12/10/93	BG140304	58
12/10/93	BG130303	66
12/10/93	BG27A0302	58
1/27/94	OD120205	71
1/27/94	OD140204	62
1/27/94	OD010206	70
1/26/94	OD020102	71
1/26/94	OD170101	84
1/26/94	OD040103	73
2/16/94	TB320303	69
2/16/94	TB290304	73
2/16/94	TB250305	69
2/15/94	TB160201	66
2/15/94	TB060202	68
2/17/94	TB160406	66
3/14/94	PD060201	71
3/14/94	PD220202	73
3/14/94	PD240205	70
3/14/94	PD180203	68
3/14/94	PD110206	71
3/14/94	PD070204	70
3/30/94	AD160102	71
3/30/94	AD090103	67
3/30/94	AD240101	70
3/30/94	AD300104	66
4/5/94	AD600506	70
4/5/94	AD500405	69

*- Caracass and pelt combined

TABLE 14
RESULTS OF MOISTURE ANALYSIS FOR MUSKRAT LIVER TISSUE
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

DATE	LOCATION	PERCENT MOISTURE
8/12/93	BC270305	75
8/12/93	BC380306	74
8/10/93	BC210101	72
8/11/93	BC370202	74
8/11/93	BC380203	76
8/12/93	BC210304	76
12/10/93	BG370307	65
12/10/93	BG210305	73
12/10/93	BG360306	60
12/10/93	BG140304	72
12/10/93	BG130303	79
12/10/93	BG27A0302	83
1/27/94	OD120205	76
1/27/94	OD140204	71
1/27/94	OD010206	74
1/26/94	OD020102	73
1/26/94	OD170101	71
1/26/94	OD040103	70
2/16/94	TB320303	72
2/16/94	TB290304	71
2/16/94	TB250305	73
2/15/94	TB160201	69
2/15/94	TB060202	72
2/17/94	TB160406	72
3/14/94	PD060201	73
3/14/94	PD220202	73
3/14/94	PD240205	73
3/14/94	PD180203	74
3/14/94	PD110206	74
3/14/94	PD070204	75
3/30/94	AD160102	73
3/30/94	AD090103	73
3/30/94	AD240101	74
3/30/94	AD300104	72
4/5/94	AD600506	75
4/5/94	AD500405	73

TABLE 15
RESULTS OF MOISTURE ANALYSIS FOR MUSKRAT KIDNEY TISSUE
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

DATE	LOCATION	PERCENT MOISTURE
8/12/93	BC270305	77
8/12/93	BC380306	80
8/10/93	BC210101	79
8/11/93	BC370202	79
8/11/93	BC380203	83
8/12/93	BC210304	77
12/10/93	BG370307	77
12/10/93	BG210305	73
12/10/93	BG360306	86
12/10/93	BG140304	77
12/10/93	BG130303	65
12/10/93	BG27A0302	60
1/27/94	OD120205	78
1/27/94	OD140204	81
1/27/94	OD010206	78
1/26/94	OD020102	78
1/26/94	OD170101	70
1/26/94	OD040103	68
2/16/94	TB320303	78
2/16/94	TB290304	78
2/16/94	TB250305	78
2/15/94	TB160201	79
2/15/94	TB060202	78
2/17/94	TB160406	80
3/14/94	PD060201	79
3/14/94	PD220202	79
3/14/94	PD240205	79
3/14/94	PD180203	78
3/14/94	PD110206	83
3/14/94	PD070204	78
3/30/94	AD160102	77
3/30/94	AD090103	77
3/30/94	AD240101	78
3/30/94	AD300104	75
4/5/94	AD600506	79
4/5/94	AD500405	78

TABLE 16
RESULTS OF MOISTURE ANALYSIS FOR MINK CARCASS TISSUE
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

DATE	LOCATION	PERCENT MOISTURE
12/9/93	BG470401	79
12/10/93	BG540502	70
12/13/93	BG610703	67
12/14/93	BG340804	71
12/21/93	BG471205	72
2/16/94	TB110301	65
2/17/94	TB110402	65
3/19/94	PD360701	66
4/7/94	AD160501	69
4/26/94	AD060210	73

TABLE 17
RESULTS OF MOISTURE ANALYSIS FOR MINK LIVER TISSUE
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

DATE	LOCATION	PERCENT MOISTURE
12/9/93	BG470401	71
12/10/93	BG540502	68
12/13/93	BG610703	79
12/14/93	BG340804	75
12/21/93	BG471205	69
2/16/94	TB110301	68
2/17/94	TB110402	76
3/19/94	PD360701	78
4/7/94	AD160501	72
4/26/94	AD060210	76

TABLE 18
RESULTS OF MOISTURE ANALYSIS FOR MINK KIDNEY TISSUE
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

DATE	LOCATION	PERCENT MOISTURE
12/9/93	BG470401	71
12/10/93	BG540502	67
12/13/93	BG610703	70
12/14/93	BG340804	82
12/21/93	BG471205	70
2/16/94	TB110301	74
2/17/94	TB110402	70
3/19/94	PD360701	78
4/7/94	AD160501	77
4/26/94	AD060210	81

TABLE 19
MINK AGE DATA[1]
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

Location	Collection Date	Sex	Age and Confidence Code (Range) in Years
BG470401	9 December 1993	Male	2A
BG540502	10 December 1993	Male	3A
BG610703	13 December 1993	Male	0A
BG340804	14 December 1993	Male	0A
BG471205	21 December 1993	Male	1A
PD360701	19 March 1994	Female	1A
TB110301	16 February 1994	Female	0A
TB110402	17 February 1994	Male	3A
AD160501	7 April 1994	Male	1A
AD060210	26 April 1994	Male	4A

[1]Aged by dentition
An age of 0 means less than 1 year old
Confidence Codes:
A - Result is certain
B - Result is almost certain, with a possible range given
C - Result is not certain, with a possible range given

TABLE 20
MUSKRAT AGE DATA[1]
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

Location	Collection Date	Sex	Age and Confidence Code (Range) in Years
BG370307	8 December 1993	Male	0A
BG27A0302	10 December 1993	Female	0A
BG130303	10 December 1993	Female	2C (2 - 4)
BG140304	10 December 1993	Female	0A
BG210305	10 December 1993	Male	0B (0 - 1)
BG360306	10 December 1993	Male	0A
OD020102	26 January 1994	Male	3C (3 - 5)
OD170101	26 January 1994	Female	2B (1 - 2)
OD040103	26 January 1994	Male	0B (0 - 1)
OD010206	27 January 1994	Female	0A
OD120205	27 January 1994	Male	3C (3 - 5)
OD140204	27 January 1994	Male	1B (1 - 2)
TB160201	15 February 1994	Male	1B (0 - 1)
TB250305	16 February 1994	Male	0A
TB290304	16 February 1994	Male	1A

[1]Aged by dentition
An age of 0 means less than 1 year old
Confidence Codes:
A - Result is certain
B - Result is almost certain, with a possible range given
C - Result is not certain, with a possible range given

TABLE 20 (Continued)
MUSKRAT AGE DATA[1]
KALAMAZOO RIVER MAMMAL STUDY
MAY 1995

Location	Collection Date	Sex	Age and Confidence Code (Range) in Years
TB320303	16 February 1994	Female	0A
TB160406	17 February 1994	Male	2C (2 - 4)
TB060202	14 March 1994	Female	1B (1 - 2)
PD060201	14 March 1994	Male	1B (1 - 2)
PD110206	14 March 1994	Male	3B (2 - 3)
PD180203	14 March 1994	Female	1B (1 - 2)
PD220202	14 March 1994	Female	2B (1 - 3)
PD070204	14 March 1994	Male	2B (1 - 3)
PD240205	14 March 1995	Male	1B (1 - 2)
AD090103	30 March 1995	Male	4B (3 - 4)
AD500405	4 April 1995	Male	1B (0 - 2)
AD600506	5 April 1995	Male	1B (1 - 2)
AD240101	30 March 1995	Female	2B (1 - 3)
AD160102	30 March 1995	Male	2B (1 - 2)
AD300104	30 March 1995	Male	4B (3 - 5)

[1]Aged by dentition
An age of 0 means less than 1 year old
Confidence Codes:
A - Result is certain
B - Result is almost certain, with a possible range given
C - Result is not certain, with a possible range given

APPENDIX A
QUALITY ASSURANCE WORK PLAN

QUALITY ASSURANCE WORK PLAN

KALAMAZOO RIVER MAMMAL PROJECT

EDISON, NJ

Prepared by
Roy F. Weston, Inc.

DECEMBER 1993

EPA Work Assignment No. 5-697
Weston Work Order No. 3347-035-001-6697
EPA Contract No. 68-03-3482

APPROVALS

Roy F. Weston, Inc.

Paul Bovitz (Date) 12/17/93
Task Leader

W. Scott Butterfield (Date) 12/17/93
Project Manager

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1.0 OBJECTIVE

The objective of this project will be to process and analyze muskrat (*Ondatra zibethicus*) and mink (*Mustela vison*) tissues collected from an ecological investigation being conducted on the Kalamazoo River, Michigan. Tissue analysis will be conducted in order to determine the concentrations of pesticides, polychlorinated biphenyls (PCBs), semi-volatile organic compounds, and heavy metals present in two representative mammalian consumers from the river ecosystem. Histopathological analyses may be conducted in the event that significant concentrations of contaminants are detected in tissue. The data will be utilized by the U.S. Environmental Protection Agency (EPA) Region V to evaluate possible influences of contaminants on the aquatic and terrestrial food chains associated with the river ecosystem.

2.0 PROJECT SCOPE

The area of investigation is an approximate sixty-mile stretch of the Kalamazoo River primarily south of Kalamazoo, Michigan. Industrial sources have historically discharged PCBs, metals, and polynuclear aromatic hydrocarbons into the river system in the vicinity of Kalamazoo, and these contaminants have migrated down river[1].

The U.S. EPA Region V is conducting the sampling portion of this investigation. They will be responsible for trapping muskrats and mink from selected locations along the Kalamazoo River suspected to be contaminated with elevated levels of PCBs and possibly metals, pesticides and semi-volatile organic compounds. Collected specimens will be partially processed in the field by the U.S. EPA Region V for preservation of select tissues for histopathological analysis. Specimens will then be sent to the U.S. EPA/Environmental Response Team (ERT), and its Response Engineering and Analytical Contractor (REAC) for final processing which will include partial necropsies, removal of select tissues, specific chemical analyses on tissues and whole body, and potentially, histopathological analyses.

The purpose of this phase of the investigation is to process and analyze the muskrat specimens provided by the U.S. EPA Region V and deliver the analytical results on the specific contaminants requested. This will allow the U.S. EPA Region V to make decisions regarding the potential ecological risk to fauna inhabiting areas along this stretch of the Kalamazoo River.

REAC will arrange for (1) the receipt of the tissue samples collected and prepared by the U.S. EPA Region V, and (2) the processing and analysis of these samples.

3.0 TECHNICAL APPROACH

3.1 Specimen Collection

The U.S. EPA Region V will be responsible for the collection of approximately 30 mink and 30 muskrat specimens from selected areas along the Kalamazoo River. Field crews should collect specimens from traps based on a short (less than every twelve hours) trap check rotation period in order to minimize predation or soft tissue degeneration. All specimens collected should be labelled immediately upon retrieval at each trap location. Once removed from the trap, the specimen should be tagged with an aluminum tag affixed to the animal through a hole made in the right hind foot with a sharp probe or forceps. Each tag should be labelled with a code denoting the project, trap area, trap number and a unique animal

identification number (e.g., the fourth animal caught for the Kalamazoo River, in Area IV, trap 34, would have the following code written on the tag: KR-AIV-34-4). When the specimen is retrieved, information on its suspected age class, sex and reproductive status, and condition, as well as the time, date and weather conditions should be recorded on a specimen data sheet (Appendix A), as well as in a field logbook. Specimens should be retained in separate large Ziploc bags to avoid possible cross-contamination. Specimens should be placed on wet ice as soon as possible.

3.2 Preliminary Processing

All specimens should be brought to a field staging area as soon as possible after collection. Specimens should be retained in coolers on wet ice until they are processed. Specimens should be processed one at a time in order to minimize the amount of time tissues are exposed out of preservation. The date and data on specimen condition as well as all other pertinent information should be recorded on the specimen data sheet. To avoid biasing the chemical analyses with contaminants lodged in the fur, specimens should initially be washed clean of all extraneous mud and debris using free-flowing tap water and vigorous scrubbing, then hand dried with a paper towel. Specimens should be weighed to the nearest 1.0 gram (gm) and checked for any gross abnormalities and ectoparasites. Standard anatomical parameters to be measured to the nearest 1.0 millimeter (mm) include total body length, tail length and right hind foot length. Specimens should then be skinned by standard casing techniques. It is important that contact between the outside of the fur and the carcass is minimized in order to avoid introducing contaminant artifacts.

Once the skin is removed, it should immediately be tagged with its appropriate project, area, trap number, and animal identification number. After tagging has been completed, skins should be stored by rolling them fur side out and placing in labelled Ziploc bags on wet ice or frozen at <0°C.

Mink and muskrat pelts will be forwarded by the U.S. EPA Region V to ERT/REAC for documentation purposes. Mink pelts will initially be checked for penis scars to determine sex of each specimen.

3.3 Decontamination

After a specimen is skinned, the carcass should be thoroughly rinsed with distilled water to wash off any contamination introduced during the skinning process. The U.S. EPA Region V personnel will conduct preliminary tissue removal and preservation. The following steps should be adhered to during invasive procedures. Trays and all dissecting tools utilized should be 100 percent stainless steel and fully decontaminated before and between each specimen dissection. Decontamination of all reusable dissection and processing equipment should involve the following sequence:

Soap and water wash
Potable water rinse
10% nitric acid rinse
Distilled water rinse
Acetone rinse
Distilled water rinse
Air dry

3.4 Partial Dissection and Tissue Removal

A partial dissection to preserve liver and kidney tissue for histopathology will be performed by the U.S. EPA Region V prior to relinquishing specimens to the ERT/REAC. An inspection of the carcass for any surficial or orificial abnormalities should be conducted. The dimensions, color, location, physical appearance and number of abnormalities should be described and noted on the specimen data sheet.

Each specimen should then be dissected according to standard necropsy procedures[2]. The dissection should be initiated by cutting into the abdominal wall just above the penis or vulva using medium, sharp/blunt dissecting scissors. Incisions should be shallow in order to avoid damage to internal organs and extend anteriorly up the central portion of the abdominal cavity to the rib cage and laterally along both sides below the rib cage and anterior of the hind legs. Reflection of the abdominal wall should extend up to the rib cage. The abdominal cavity should be scanned for gross abnormalities and any should be noted.

Removal of the liver tissue sections for histopathology should be performed as follows. The medial lobe of the liver should be carefully grasped with blunt forceps. Two liver tissue sections should be cut starting at the distal end of the medial lobe. The sections should be cut 1.0 centimeter (cm) towards the center of the lobe, and be approximately 0.5 cm thick and 1.0 cm wide. Tissue section areas may be prioritized to include obvious lesions or abnormalities. Tissues should be cut using sharp fine dissecting scissors and handled carefully. The sections should be placed into a 40-milliliter glass vial filled with 10% neutral buffered formalin (10% buffered formaldehyde) solution. The remaining liver should be left intact in the abdominal cavity. The color and condition of the liver should be noted with respect to infestations of nematodes or cestodes.

Removal of the kidney tissue for histopathology should be performed as follows: the right kidney should be lifted with blunt forceps while cutting the underlying fatty connective tissue with scissors or a scalpel. Care should be taken to avoid severing the renal artery and vein and dislodging the kidney. The right kidney should be severed longitudinally in half so that a full medial section of the kidney is excised. The remainder of the kidney, which should still be attached to the right renal artery and vein, is to be left in the body cavity. Care should also be taken not to sever the right adrenal gland which lies on the anterior end of the kidney and is separated by a thin layer of connective tissue. The kidney section should be placed in the vial of preservative along with the liver section. One vial should be used for each individual. The vials should be labelled with the individual animal's identification code.

3.5 Sample Handling and Shipment

After removing the liver and kidney sections, each specimen should be placed into individually labelled Ziploc bags and sealed. Each bag should have a sample label attached to it marked with the specimen's identification code and date of collection. Those bags should in turn be put into a second outer Ziploc bag and placed in a cooler on wet ice. It is important that the specimens do not decompose, yet do not freeze. Thus, specimens should be retained as close as possible to 1°C until final processing at the REAC laboratory. Dry ice should not be used, since it will result in freezing the specimens, possibly influencing organ metrics to be recorded at REAC. Specimens and pelts should be shipped out at least every two days in order to allow for final processing before analytical holding times are exceeded.

Specimens must be processed for histopathology on the same day they are collected from the field. Sample vials retained with tissue sections for histopathology should be checked for a firm cap seal, placed in individual Ziploc bags and placed upright in a separate cooler on wet ice or in a refrigerator at 4°C.

The following procedures should be followed for shipping specimens to ERT/ REAC: whole body and histopathology tissues should be retained at 1°C and 4°C, respectively, immediately prior to shipping. Whole body samples and their respective pelts should be placed in coolers lined with a large polyethylene bag. The bottom of the bags should be lined with vermiculite or other non-combustible, absorbent, cushioning material to minimize the possibility of sample damage and to absorb any fluids that may leak from samples. The double Ziploc bags containing the specimens and pelts should be placed on top of the vermiculite.

Wet ice may be retained in polyethylene bags. A Federal Express Dangerous Goods Air Bill does not have to be filed for shipment, although a regular Federal Express Air Bill must be filled out.

Vermiculite or like substance should be added on top and between the samples and the ice. The completed chain of custody (COC-see below) should be placed in a Ziploc bag and taped to the inside lid of the cooler. The COC should be double verified that it reflects the exact specimens and pelts contained in the cooler(see below). The cooler should be secured with duct tape, and have signed custody seals placed over at least two locations along the seal. The custody seals should be sealed with clear shipping tape. Coolers should be clearly labelled as "Environmental Samples". In addition, two sides of the cooler should be marked with "This End Up" or arrow labels.

These general shipping procedures should also be followed for the histology samples. Exceptions to these procedures are as follows: use only wet ice double-packed and sealed for packaging and shipping. Fill out a regular Federal Express Air Bill denoting Priority One Overnight service (Appendix A). No vent hole in the cooler is necessary.

The samples should be sent Federal Express Priority One Overnight to the Roy F. Weston/REAC Biology Laboratory, GSA Raritan Depot, 2890 Woodbridge Ave, Bldg. 209 Annex, Edison, NJ 08837-3679, Attention: Paul Bovitz (Appendix A).

3.6 Completion of the Chain of Custody

3.6.1 General Information

All COC records must be completed legibly and in permanent ink. A separate COC record will be prepared for each container used for transporting samples (i.e., cooler) and will include the following information:

Project Name - Kalamazoo River
Project Number - Enter Work Order No. 03347-035-001-6697
ERT/REACContact - Paul Bovitz - analyses are to be performed by REAC
Phone - 908-321-4210.
Sheet No. - Indicate page "X" of the total number of pages completed for each respective cooler.

3.6.2 Sample Identification and Analysis Requested

REAC# - NA should be entered in this column.
Sample No. - Enter the sample identification number attached to each sample container (e.g., Kalamazoo River, animal #34 would be KR-34).
Sample Location - The sampling location is the station (i.e., Area A, trap location 10 would be A-10) at which the sample was collected.
Matrix - Enter the type of sample collected. Utilize the abbreviations listed on the COC. When using "X" to represent a matrix not specifically listed, be sure to include a description of the matrix in the "Special Instructions" section of the form. In this case the description should read "mink tissue" or "muskrat tissue".
Date Collected - Indicate the date when the sample was collected. If the analysis is time sensitive, the collection time should also be included.
Number of Bottles - Indicate the number of bottles collected for the analysis requested.
Container/Preservative - Indicate sample bottle size, and preservatives (if applicable). If the container is other than clear glass, this must be indicated on the form (i.e. __ gallon Ziploc bag).
Analyses Requested - The analyses requested should be noted on the top line of these columns and a check mark or "X" used to designate that this is the analysis requested for the sample containers indicated.

After all of the appropriate information is entered for a particular cooler, a diagonal line should be drawn across those spaces left blank thereby disallowing further additions.

3.6.3 Special Instructions

This section should be used to indicate any special analytical requirements. Arrangements for special analytical requirements must be made in advance and should be transmitted verbally to the REAC Task Leader. The notation in this section serves as a reminder to those involved in the project. Information of this nature is extremely beneficial to the laboratory for determining sample modifications of operating procedures or analytical methods.

3.6.4 Sign-Off

Items/Reasons - Enter "all above" or the number of sample bottles or containers listed to indicate that all items are being transferred. The sample custodian must also indicate the reason for transfer (i.e., analysis, storage, archiving, etc.)
Relinquished by - The sample custodian relinquishing the samples signs his/her name, and enters the date.
Received by - This will be completed by the receiving lab personnel.
Date - Recipient enters that day's date.
Time - Recipient enters time of day using military time notation.

The top, original signature copy and the middle sheet of the COC record are enclosed in a Ziploc bag, sealed and secured with tape to the inside of the cooler lid. The bottom copy of the COC record should be retained for the Sample Custodian's files. The Sample Custodian must Federal Express or FAX a copy of the COC forms

on the same day of shipment to ERT/REAC at (908) 494-4021 to the attention of Paul Bovitz. After securing shipping coolers, at least two custody seals must be placed across cooler openings. As long as the COC records are sealed inside the sample cooler and custody seals remain intact, commercial carriers are not required to sign the COC form.

3.6.5 Sample Storage Requirements

Samples must be stored in shipping containers or coolers with the COC record inside. The shipping container or cooler must be secured in a fashion such that once the container is closed, any access is clearly evident.

Storage in a locked room or vehicle is permitted as long as the above procedures are followed.

3.7 Biological Processing

Whole body specimens, pelts, and histology samples will be received by the REAC Task Leader. Specimens will be checked against their respective chain of custodies. Whole body specimens and pelts will be immediately transferred to a freezer at <0°C. Histology samples will be retained at 4°C until submission for analysis.

Final processing of whole body specimens in preparation for chemical analysis will be completed within 24 hours after arrival at REAC. Final biological processing will include:

(1) removing and weighing the liver, kidneys, adrenal glands, reproductive tracts, spleen, and thymus;

(2) removing and weighing contents of the gastrointestinal tract, and rinsing the tract with distilled water;

(3) returning all organs to the central body cavity (except liver and kidney);

(4) submitting the liver, kidney, and whole body tissues for homogenization and analysis;

(5) removal of the lower left jaw for aging by dentition.

The procedures for organ and tissue removal will be in the order as follows.

3.7.1 Collection of the Reproductive Tract

3.7.1.1 Male Reproductive System

The central body cavity will be reopened along the incisions made by the U.S. EPA Region V. The testes will be pulled out of the scrotum and the gubernaculum testis will be severed. Next, the distal end of the vas deferens will be severed and separated from the epididymis and testis. The epididymis and testis will then be separated and the testes cleaned of extraneous connective tissue.

The testes will be weighed to the nearest 0.001 gm and length and width measured to the nearest 1.0 mm.

3.7.1.2 Female Reproductive System

The central body cavity will be reopened along the incisions made by the U.S. EPA Region V. Fine scissors will be used to cut the mesentery tissue supporting the uterine horns up to the ovaries. The connective tissue between the ovaries and the kidneys will be severed. The uterus and ovaries will be separated adjacent to the distal side of the cervix. The ovaries will be weighed to the nearest 0.001 gm and length and width of each will be recorded to the nearest 1.0 mm. Any abnormalities, uterine scars, or embryos will be noted.

If embryos are present, the number present in each uterine horn will be noted. Usually the embryos are of similar size and development. If this is not the case, differences will be noted in detail. Measurements will be taken of one of the embryos which appears to be of average size and mass. The embryo length and width will be measured to the nearest 1.0 mm, while the weight will be taken to the nearest 0.01 gm.

3.7.2. Collection of the Spleen

The spleen is located above the left kidney and descending colon, and behind the fundus of the stomach. The stomach will be gently lifted and the spleen separated from the stomach connective tissue using forceps and fine dissecting scissors. The spleen will be cleaned of extraneous connective tissue and weighed to the nearest 0.01 gm.

3.7.3. Collection of the Liver, Kidney and Adrenal Glands

The connective tissue under the medial lobe of the liver will be carefully lifted with forceps and the esophagus and blood vessels entering the diaphragm will be severed. The remaining connective tissue attached to the liver will be severed, the liver removed and placed into an aluminum weighing boat.

The liver will be weighed to the nearest 0.01 gm, with the weight of the histopathology section noted separately. Color and condition of the liver tissue should be noted. The liver will be enclosed in a glass jar labeled with the project initials, animal identification number and date and retained on dry ice or in a freezer at <0°C.

The kidneys will be located and the renal artery and vein of both the right and left kidneys will be severed with scissors. The kidneys will be lifted with forceps while cutting the surrounding fatty connective tissue. The kidneys will be cleaned of extraneous fat and connective tissue. The adrenal glands located on the anterior portion of each kidney will be removed by carefully severing the thin layer of connective tissue between the organs. The kidneys will be individually weighed to the nearest 0.01 gm noting separately the weight of the tissue section removed from the right kidney for histology. The kidneys will be placed into a glass jar labelled with the project initials, animal identification number and date and retained on dry ice or in a freezer at <0°C. The adrenal glands will be cleaned of extraneous

connective and fat tissue and individually weighed to the nearest 0.001 gm.

3.7.4 Collection of the Thymus

In order to gain access to the thymus, the thoracic cavity will be opened. Using a pair of large dissecting scissors, the cartilaginous portion of the ribs will be cut anteriorly to the neck. The rib cage will be spread apart and the ventral rib cage removed by making an anterior cut along each of the lateral sides of the rib cage. The thymus will be located at the base of the trachea, above the heart.

The thymus will be removed by severing the anterior base of the organ and gently lifting with blunt forceps. The thymus will be cleaned of extraneous fat and connective tissue and weighed to the nearest 0.001 gm.

3.7.5 Collection of Gastrointestinal Material

Stomach contents of two specimens per batch of six to ten individuals will be extracted and retained for future analysis. Stomachs will be severed anterior to the fundus and duodenum, cut open along the fundus and greater curvature, and the contents emptied. The contents will be weighed to the nearest 0.001 gm and inspected for identifiable food items. Food items, color and condition of internal matter will be noted on specimen data sheets. The contents will then be placed into a glass jar, labelled with the respective animal identification code, placed in a Ziploc bag, sealed, and retained in a freezer at <0°C. Stomach contents will be retained for possible future residue analysis until after all other analyses have been completed. The stomach will be rinsed with distilled water and returned to the central body cavity for inclusion in the whole body analysis.

Contents of the GI tract from the sigmoid colon down to the rectum and anal canal will be extracted and retained for possible future analysis. The gastrointestinal (GI) tract will be severed at the posterior end of the descending colon and removed. Fecal matter that is contained in this portion of the GI tract will be squeezed into a previously weighed 40 milliliter glass vial. The vial will be reweighed to determine the exact mass of fecal matter removed, tightly capped, labelled with the animal identification code, and placed in a freezer at <0°C. The section of the GI tract that was removed will be rinsed with distilled water and returned to the central body cavity for inclusion in the whole body analysis.

3.7.6 Final Disposition of Tissues

During dissection and processing, all tissues removed, except for liver and kidney tissues, will be retained in glass petri dishes in isotonic saline solution in order to prevent dessication. All organs or tissues removed from individual specimens, except for liver and kidney tissues, will be returned to the central body cavity of their respective carcass following completion of whole body processing. Specimens will be cut into three sections, placed in Ziploc bags labelled with the project initials, animal identification number and date, the bags will be sealed, and retained on dry ice or in a freezer at <0°C. A separate COC will be originated for liver, kidney and whole body tissue indicating the respective analyses to be performed by the ERT/REAC Biology Laboratory. Liver and kidney tissue will be frozen in glass jars until homogenization.

Liver tissues will receive first priority for analysis. Analytical processes will be initiated for liver tissue immediately after the tissues are removed and COCs have been relinquished to the ERT/REAC analytical laboratory. Kidney and whole body homogenate will remain frozen until the completion of all analyses for liver tissue. Specimens are expected to arrive in batches of six to ten individuals every two to three days. If processing of liver tissues is completed for one batch before the arrival of a second batch then kidney and whole body tissue processing will be initiated. Initial analytical processing of tissues will include homogenization under CO_2, sublimation, and extraction. Analysis of tissue extracts will be performed within holding times identified in Table 9.1.

Prioritization of tissue analysis will be in the following order: Liver tissue will undergo analysis for pesticides/PCBs, percent lipids, and percent moisture. Whole body tissue will undergo analysis for pesticides/PCBs, semi-volatile organics, percent lipids, percent moisture and target analyte list (TAL) metals. Kidney tissue will undergo analysis for TAL Metals and percent moisture.

3.8 Analytical Tissue Requirements

The REAC tissue laboratory requires at least 1.5 g of tissue per sample for TAL metals analysis, of which 0.5 g is required for arsenic/selenium analysis, and 0.5 g is required for mercury analysis. For MS/MSD samples, an additional 0.5 g of tissue is required. MS/MSD samples will be analyzed for both muskrat and mink.

A minimum of 1 g of tissue is required for percent moisture analysis for each tissue matrix (whole body, liver and kidney). Due to the small size of muskrat and mink kidneys in subadult animals, in some cases there may be insufficient tissue mass to conduct all analyses at the action levels identified in Table 9.1. If this is the case, the Work Assignment Manager will be consulted as to the priority of analyses.

Pesticide/PCB, percent lipid and moisture analyses collectively require at least 15 grams of total tissue per sample. Semi-volatile organics, percent lipid and moisture analyses also require at least 15 grams of tissue per sample. Tissue samples from the liver and whole body are expected to meet all analytical mass requirements without pooling of tissue.

The preservation fluids for the liver and kidney histological sections will be changed with fresh 10% buffered formaldehyde within three days after receipt at REAC. Samples will be held at the REAC Biology Laboratory until they are sent to a subcontracting laboratory for histopathological analysis.

3.9 Equipment Decontamination

All dissection procedures will be conducted with 100% stainless steel decontaminated trays and instruments. All dissecting tools will be decontaminated before dissecting the next specimen, with new scalpel blades being used for each specimen. All animal tissue residues will be disposed of with other site generated waste in accordance with EPA ERT/REAC policy.

The following decontamination sequence will be employed for dissecting tools and trays before and after dissecting each animal:

Soap and water
Potable water rinse
10% nitric acid rinse
Distilled water rinse
Acetone rinse
Distilled water rinse
Air dry

3.10 Standard Operating Procedures

3.10.1 Sample Documentation

All sample documents will be completed legibly, and in ink. Any corrections or revisions will be made by lining through the incorrect entry and by initialing the error.

Logbook

The site or laboratory logbook is used to record data and observations so that an accurate account of field operations can be reconstructed in the writer's absence. The logbook is essentially a descriptive notebook detailing site activities and observations. All entries will be dated and signed by the individual(s) making the entries and should contain the following information (unless formally recorded elsewhere):

- Site name and location on inside cover
- Date and location of field work
- Times (military times preferred, or reference a.m. or p.m.)
- Names and addresses of field or laboratory contacts
- Site sketches and photographic references
- Weather conditions
- Sample descriptions, locations, times taken, identification numbers
- Chain of custody information, shipping paper identification number, recipient address and phone number, etc.
- Field or laboratory observations and discussion
- Field or laboratory measurements (i.e., Ph, temperature, surface water flow rates, etc.)
- Instructions issued by field or laboratory supervisors, representatives of the U.S. EPA and others.

Specimen Data Sheets and Sample Labels

Specimen data sheets and corresponding sample labels are used to identify samples and document field and laboratory sampling conditions and activities. Specimen data sheets will be maintained by the Task Leader or designee; and at a minimum, originals will be filed in a central location. As necessary, copies of field data sheets can be appended to Trip or Final Reports.

Chain of Custody

A chain of custody record must be maintained from the time a sample is taken to the final deposition of the sample.

The chain of custody record shall contain, at a minimum, the following information: project name, project number, the REAC contact and their telephone number. For each sample collected, the chain of custody record shall include the sample number, sampling location, sample matrix, date collected, container/preservative, the analysis requested, and special instructions, if any are applicable.

Chain of custody records must be completed legibly and in ink, with all required information, so that miscommunication with, or misunderstanding by, the receiving laboratory can be prevented.

Every transfer of custody must be noted and signed for on the chain of custody record. If a sample or group of samples is not under direct control or observation of the individual responsible for the samples, then they must be stored in a locked container that has been sealed with a chain of custody seal. A copy of the chain of custody record should be kept by each individual who has signed it. The final copy should be included with the Analytical Report.

Chain of Custody Seals

Chain of custody seals demonstrate that a sample container has not been opened or tampered with during transport or storage samples. The seal or seals should be affixed in such a manner that the container cannot be opened without breaking the seal. The person in direct possession of the samples shall sign and date the seal. The name of the individual signing the seal and a description of the packaging shall be noted in the site logbook.

NOTE: A copy of the original specimen data sheets from field activities of the U.S. EPA Region V, should be provided along with the COC in each cooler of samples. A copy of all pertinent field notes should also be sent to the REAC Task Leader.

3.10.2 Sampling Techniques

All animal processing and dissection will follow REAC Draft SOPs, Muskrat Trapping, and Small Mammal Dissection and Tissue Processing (#2039).

3.11 Waste Residuals Disposal

All of the residual tissue samples will be maintained for 60 days after the issuance of the final report. If no additional work has been requested at the end of the 60 days, the Work Assignment Manger will be contacted and notified of arrangements being made for disposal. Samples will not be disposed of without prior approval of the Work Assignment Manager.

4.0 PROJECT MANAGEMENT AND REPORTING

The Weston/REAC Task Leader will maintain contact with the U.S. EPA/ERT Work Assignment Manager to provide information on the technical and financial progress of this study. Analytical results will be presented in a final analytical report as described in Section 8.0. Activities will be summarized in appropriate format for inclusion in REAC Monthly and Annual Reports under the Kalamazoo River Work Assignment.

Weston personnel performing work under this work assignment have received the Weston Conflict of Interest Policy and Operating Practice and been informed of their obligation to report personal conflicts of interest. Each employee has agreed to this policy by signing a statement related to conflict of interest responsibilities. In addition, Weston has conducted a search of its conflict of interest data base in reference to this work assignment and has found no actual or potential conflict of interest with the acceptance of this task. Lastly, Weston recognizes the continuing obligation to identify and report any actual or potential conflicts of interest arising at any time during performance of this work assignment.

5.0 PROJECT SCHEDULE

A Revised Quality Assurance Work Plan will be delivered to the Work Assignment Manager by 12/15/93. Field operations began on 12/08/93. Specimens are expected to arrive in batches of six to ten individuals every two to three days. Specimens will be processed for analyses within 24 hours after receipt at REAC. Metrics will be taken on animals and recorded into the REAC small mammal data base.

Liver, kidney, and whole body tissue samples are expected to be transferred from the processing laboratory to the REAC analytical coordinator, Tony LoSurdo, via a COC, once processing has been completed. Preliminary analytical results are expected by 1/28/93. The issuance of a final analytical report is expected by 2/12/94. The overall project is expected to close out with the issuance of a Final O&A Report including analytical results and a specimen database by 2/26/94. Refer to the attached project schedule chart and Section 8.0 for an illustration of milestones and deliverable due dates.

6.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

All field collection of specimens will be performed by the U.S. EPA Region V. They will also conduct preliminary processing of specimens which will include taking standard metrics, tagging, skinning and removal of tissues for histology, as aforementioned. They will then ship specimens on ice, according to the protocols outlined, to the REAC facility where final processing and analysis of specimens will be conducted.

The REAC Task Leader, Paul Bovitz, is the primary REAC point of contact with the EPA Work Assignment Manager. The Task Leader is responsible for the development and completion of the QAWP, project team organization, and supervision of all project tasks, including reporting and deliverables.

The REAC Site/QC Coordinator, Phil Kim, is responsible for ensuring field adherence to the QAWP and recording any deviations from the QAWP. The Site QC Coordinator is also the primary project team contact with the REAC lab.

The project analytical coordinator, Tony LoSurdo, will be responsible for the coordination of laboratory analyses, and the reporting of analytical results.

The following REAC personnel will work on the processing stage of this project:

Personnel	Responsibility
Paul Bovitz	Project Coordination/Lab Dissection
Phil Kim	Lab Dissection/Sample Documentation
Matt Donohue	Lab Dissection
Tom Kalucki	Lab Dissection / Sample Preparation
Tony Scrittorale	Lab Dissection / Sample Preparation
Jackie Marrone	Lab Dissection / Sample Preparation
Tony LoSurdo	Laboratory Coordination
Ivan Acevedo	Sample Preparation

The REAC QA Officer (Chris Andreas), Health and Safety Officer (Tamre Noblet), and Section Chiefs (Gary Buchanan and Vinod Kansal) are responsible for auditing and guiding the project team, reviewing the final deliverables and proposing corrective action, if necessary, for nonconformity to the QAWP or HASP.

While not specifically identified, activities such as video documentation, photodocumentation, computer graphics and support, statistics, word processing and report preparation and purchasing support may be required in order to accomplish the objectives of this project.

7.0 MANPOWER AND COST PROJECTIONS

At this time no travel is anticipated for this work assignment. However, it may become necessary for the Task Leader to provide technical support in the field to the US EPA Region V in conjunction with the Work Assignment Manager. If this scenario is deemed necessary by the Work Assignment Manager then expenses would be approximately as follows:

-Number of trips	1 trip to Kalamazoo, MI
-Number of days	3-5 days
-Personnel	1 individual
-Per diem	90/day
-Other costs	$1500

The estimated costs (including labor, travel, materials and equipment, subcontractor, and analytical) to complete this project are included in the cost summary provided to the Work Assignment Manager as part of the Quality Assurance Work Plan for the Kalamazoo River Work Assignment.

8.0 DELIVERABLES

The following deliverables will be provided under this project:

	ITEM	DATE
X	Revised QAWP	12/15/93
X	Preliminary Report	01/28/94
X	Final Analytical Report	02/12/94
X	Final O&A Report	02/26/94

9.0 QUALITY ASSURANCE

The following QA objectives and protocols apply, as per Tables 9.1 and 9.2:

The following QA Protocols for QA-1 data are applicable to all sample matrices and include:

1. Provide sample documentation in the form of field logbooks, the appropriate field data sheets and chain of custody forms.
2. All instrument calibration and/or performance check procedures/methods will be summarized and documented in the field/personal or instrument log notebook.
3. The detection limit will be determined and recorded, along with the data, where appropriate.

The following QA Protocols for QA-2 data are applicable to all sample matrices and include:

1. Provide sample documentation in the form of field logbooks, the appropriate field data sheets and chain custody forms. Chain of custody sheets are optional for field screening locations.

2. All instrument calibration and/or performance check procedures/methods will be summarized and documented in the field/personal or instrument log notebook.

3. The detection limit will be determined and recorded, along with the data, where appropriate.

4. Document sample holding times; this includes documentation of sample collection and analysis dates.

5. Provide initial and continuing instrument calibration data.

6. For soil, sediment and water samples, include rinsate blanks and trip blanks at the rate specified in Table 6.1, footnote 2 and 3, respectively.

7. Performance Evaluation samples are optional, if available.

8. Definitive identification

   Unscreened data - confirm the identification of analytes via an EPA-approved method on all unscreened environmental samples; provide documentation such as gas chromatograms, mass spectra, etc.

Non-definitive quantitation

Unscreened data - provide documentation of quantitative results.

Numbers of samples to be collected for this field study are entered onto Table 5.1, Field Sampling Summary, and Table 5.2, QA/QC Analysis and Objectives Summary, to facilitate ready identification of analytical parameters desired, number of samples required and associated number, and type of QA/QC control samples required based on the QA level.

All project deliverables will receive an internal peer QC review prior to release, as per guidelines established in the REAC Quality Assurance Program Plan.

Table 9.1 Sample Summary - Tissue

Analytical Parameter	Action Level[1]	Matrix *	Container Type and Volume (# Containers rq'd)	Preservative **	Holding Times	Subtotal Samples	QC Extra's: Rinsate Blanks[2]	QC Extra's: Field/ Trip Blanks[3]	QC Extra's: PE Samples[4]	QC Extra's: Total Matrix Spikes[5]	Total Field Samples[6]
TAL METALS	100 ppb	X1	30 whole body 30 kidney samples	<0°C	6 mon	120	NA	NA	NA	6	120
		X2	30 whole body 30 kidney samples							6	
PEST/PCB	100 ppb	X1	30 whole body 30 liver samples	<0°C	14 days	120	NA	NA	NA	6	120
		X2	30 whole body 30 liver samples							6	
BNA	500 ppb	X1	30 whole body	<0°C	14 days	60	NA	NA	NA	3	60
		X2	30 whole body							3	
Percent Moisture	NA	X1	30 whole body 30 liver samples 30 kidney samples	<0°C	NA	180	NA	NA	NA	NA	180
		X2	30 whole body 30 liver samples 30 kidney samples								
Percent Lipids	NA	X1	30 whole body 30 liver samples	<0°C	NA	120	NA	NA	NA	NA	120
		X2	30 whole body 30 liver samples								

* Matrix: X1- Muskrat Tissue, X2-Mink Tissue

**Whole body specimens will be retained at 1°C until final processing at the REAC facility; samples will then be homogenized and preserved at <0°C.

1. The concentration level, specific or generic, that is needed in order to make an evaluation. This level will provide a basis for determining the analytical method to be used.
2. If dedicated sampling tools are not used, rinsate blanks are required for the aqueous matrix. They are optional for the soil matrix. For QA2 and QA3, a minimum of one blank required per type of sampling device per day. For QA1, enter "N/A".
3. Field blanks are required for aqueous and non-aqueous matrices. Aqueous field blanks are prepared with distilled water and non-aqueous field blanks are prepared with clean sand or soil. For QA2 and QA3, one blank required per day. For QA1, enter "N/A". For QA2 and QA3, one trip blank required per cooler used to transport VOA samples. For QA1, enter "N/A". Each aqueous trip blank consists of two 40ml vials filled with distilled water. Each non-aqueous trip blank consists of two 40 ml vials filled with clean sand or soil.
4. Performance evaluation samples are optional for QA2 and mandatory for QA3 at one per parameter per matrix. For QA1, enter "N/A".
5. Ensure that sufficient volume of environmental sample is collected for lab spiking. All analyses conducted at the REAC laboratories require matrix spike samples at a frequency of ≥10% total samples, regardless of QA Objective. In addition, for QA2 (optional) and for QA3 (mandatory): Determine bias (% recovery) using a minimum of 2 matrix spikes. Determine precision using a minimum of 8 matrix spikes.
6. Add the numbers of rinsate blanks, field blanks, trip blanks, and PE samples to the subtotal number of samples to determine this.

WESTON
MANAGERS DESIGNERS/CONSULTANTS
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PAUL BOVITZ

MEMO TO: David Charters, USEPA/ERT

FROM: A. LoSurdo

THRU: W. Scott Butterfield

DATE: December 18, 1990

SUBJECT: Chemical Methods for Biological Tissues
Summary Tables (WA #3347-21-01-3407)
Final Revised Version

The "Chemical Methods for Biological Tissues" Summary Tables recapitulating methodologies, sample mass, and quantifiable method detection limits (QMDLs) for VOAs, BNAs, Pesticides/PCBs, metals, and polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) have been completed. The Tables are being submitted as part of the requirements of Phase 1 of the Work Assignment.

In addition, I am submitting detailed procedures (part of Phase 2 requirements) for "Bio-Tissue" sample preparation for VOAs, BNAs and Pesticides/PCBs. These are, in my opinion, adequate cost effective procedures summarized from the copious scientific literature surveyed.

cc: R. Singhvi
W. Coakley
W. S. Butterfield
N. Zygmont

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TABLE 1. QUANTIFIABLE METHOD DETECTION LIMITS (QMDLs) FOR ORGANICS TARGET COMPOUND LIST (TCL) BASED ON 10 GRAM BIOLOGICAL TISSUES SAMPLE PER EACH COMPOUND CLASS (VOAs, BNAs, and Pesticides/PCBs)

		QMDL (ug/kg)[1]		Extraction[2]	
Volatile Compounds		GC/MS	REF	Method	REF
1.	Acetone	1	1-5		1-5
2.	Acrolein	1	1-5		1-5
3.	Acrylonitrile	1	1-5		1-5
4.	Benzene	1	1-5		1-5
5.	Bromoform	1	1-5		1-5
6.	Bromodichloromethane	1	1-5		1-5
7.	Bromomethane	1	1-5		1-5
8.	2-Butanone	1	1-5		1-5
9.	Carbon disulfide	1	1-5		1-5
10.	Carbon tetrachloride	1	1-5		1-5
11.	Chlorobenzene	1	1-5		1-5
12.	Chloroethane	1	1-5		1-5
13.	Chloromethane	1	1-5		1-5
14.	Chlorodibromomethane	1	1-5		1-5
15.	Chloroform	1	1-5		1-5
16.	1,1-Dichloroethane	1	1-5	Method 1:	1-5
17.	1,2-Dichloroethane	1	1-5	Vacuum Distillation	1-5
18.	1,1-Dichloroethene	1	1-5		1-5
19.	t-1,2-Dichloroethene	1	1-5		1-5
20.	1,2-Dichloropropane	1	1-5		1-5
21.	c-1,3-Dichloropropene	1	1-5		1-5
22.	t-1,3-Dichloropropene	1	1-5		1-5
23.	Ethylbenzene	1	1-5		1-5
24.	2-Hexanone	1	1-5		1-5
25.	Methylene chloride	1	1-5		1-5
26.	4-Methyl-2-pentanone	1	1-5		1-5
27.	Styrene	1	1-5		1-5
28.	1,1,2,2-Tetrachloroethane	1	1-5		1-5
29.	Tetrachloroethene	1	1-5		1-5
30.	Toluene	1	1-5		1-5
31.	Xylenes	1	1-5		1-5
32.	1,1,1-Trichloroethane	1	1-5		1-5
33.	1,1,2-Trichloroethane	1	1-5		1-5
34.	Trichloroethene	1	1-5		1-5
35.	Vinyl acetate	1	1-5		1-5
36.	Vinyl chloride	1	1-5		1-5

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		QMDL (ug/kg)[1]		Extraction[2]	
	Semi-Volatile Compounds	GC/MS	REF	Method	REF
1.	Acenaphthene	500	4-6		4-6
2.	Acenaphthylene	500	4-6		4-6
3.	Anthracene	500	4-6		4-6
4.	Benzo(a)anthracene	500	4-6		4-6
5.	Benzo(a)pyrene	500	4-6		4-6
6.	Benzidine	500	4-6		4-6
7.	Benzo(b)fluoranthene	500	4-6		4-6
8.	Benzo(ghi)perylene	500	4-6		4-6
9.	Benzo(k)fluoranthene	500	4-6		4-6
10.	Benzoic acid	2500	4-6		4-6
11.	Benzyl alcohol	500	4-6		4-6
12.	Bis(2-chloroethoxy)methane	500	4-6		4-6
13.	Bis(2-chloroethyl)ether	500	4-6		4-6
14.	Bis(2-chloroisopropyl)ether	500	4-6		4-6
15.	Bis(2-ethylhexyl)phthalate	500	4-6		4-6
16.	4-Bromophenyl phenyl ether	500	4-6		4-6
17.	Butyl benzyl phthalate	500	4-6	Method 2:	4-6
18.	4-Chloro-3-methylphenol (p-Chloro-m-Cresol)	500	4-6	Soxhlet Extraction or	4-6
19.	4-Chloroaniline	500	4-6	Method 3:	4-6
20.	2-Chloroethyl vinyl ether	500	4-6	Solvent Extraction	4-6
21.	2-Chloronaphthalene	500	4-6		4-6
22.	2-Chlorophenol	500	4-6		4-6
23.	4-Chlorophenyl phenyl ether	500	4-6		4-6
24.	Chrysene	500	4-6		4-6
25.	Di-n-butylphthalate	500	4-6		4-6
26.	Di-n-octylphthalate	500	4-6		4-6
27.	Dibenz(a,h)anthracene	500	4-6		4-6
28.	Dibenzofuran	500	4-6		4-6
29.	1,2-Dichlorobenzene	500	4-6		4-6
30.	1,3-Dichlorobenzene	500	4-6		4-6
31.	1,4-Dichlorobenzene	500	4-6		4-6
32.	3,3'-Dichlorobenzidine	1000	4-6		4-6
33.	2,4-Dichlorophenol	500	4-6		4-6
34.	Diethyl phthalate	500	4-6		4-6
35.	Dimethyl phthalate	500	4-6		4-6
36.	2,4-Dimethylphenol	500	4-6		4-6
37.	4,6-Dinitro-2-methylphenol	500	4-6		4-6
38.	2,4-Dinitrophenol	2500	4-6		4-6
39.	2,4-Dinitrotoluene	500	4-6		4-6
40.	2,6-Dinitrotoluene	500	4-6		4-6
41.	1,2-Diphenylhydrazine	500	4-6		4-6

TABLE 1. QUANTIFIABLE METHOD DETECTION LIMITS (QMDLs) FOR ORGANICS TARGET COMPOUND LIST (TCL) BASED ON 10 GRAM BIOLOGICAL TISSUES SAMPLE PER EACH COMPOUND CLASS (VOAs, BNAs, and Pesticides/PCBs)

		QMDL (ug/kg)[1]		Extraction[2]	
Semi-Volatile Compounds		GC/MS	REF	Method	REF
42.	Flouranthene	500	4-6		4-6
43.	Flourene	500	4-6		4-6
44.	Hexachlorobenzene	500	4-6		4-6
45.	Hexachlorobutadiene	500	4-6		4-6
46.	Hexachlorocyclopentadiene	500	4-6		4-6
47.	Hexachloroethane	500	4-6		4-6
48.	Indeno(1,2,3, -cd)pyrene	500	4-6		4-6
49.	Isophorone	500	4-6		4-6
50.	2-Methylnaphthalene	500	4-6		4-6
51.	2-Methylphenol	500	4-6	Method 2:	4-6
52.	4-Methylphenol	500	4-6	Soxhlet Extraction	4-6
53.	N-Nitrosodi-n-propylamine	500	4-6	or	4-6
54.	N-Nitrosodimethylamine	500	4-6	Method 3:	4-6
55.	N-Nitrosodiphenylamine	500	4-6	Solvent Extraction	4-6
56.	Napthalene	500	4-6		4-6
57.	2-Nitroaniline	2500	4-6		4-6
58.	3-Nitroaniline	2500	4-6		4-6
59.	4-Nitroaniline	2500	4-6		4-6
60.	Nitrobenzene	500	4-6		4-6
61.	2-Nitrophenol	500	4-6		4-6
62.	4-Nitrophenol	2500	4-6		4-6
63.	Pentachlorophenol	2500	4-6		4-6
64.	Phenanthrene	500	4-6		4-6
65.	Phenol	500	4-6		4-6
66.	Pyrene	500	4-6		4-6
67.	1,2,4-Trichlorobenzene	500	4-6		4-6
68.	2,4,5-Trichlorophenol	2500	4-6		4-6
69.	2,4,6-Trichlorophenol	500	4-6		4-6
Pesticides/PCBs Compounds		GC/ECD			
1.	Aldrin	4	5,7,8	Method 4:	5,7,8
2.	Dieldrin	4	5,7,8	Soxhlet Extraction	5,7,8
3.	Chlorodane	4	5,7,8	or	5,7,8
4.	Alpha-chlordane	4	5,7,8	Method 5:	5,7,8
5.	Gamma-chlordane	4	5,7,8	Soxhlet Extraction	5,7,8
6.	4,4'-DDT	4	5,7,8	or	5,7,8
7.	4,4'-DDD	4	5,7,8	Method 6:	5,7,8
8.	4,4'-DDE	4	5,7,8	Column Extraction	5,7,8
9.	Endosulfan I	4	5,7,8		5,7,8
10.	Endosulfan II	4	5,7,8		5,7,8

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		QMDL (ug/kg)[1]		Extraction[2]	
Pesticide/PCBs Compounds		GC/ECD	REF	Method	REF
11.	Endosulfan Sulfate	4	5,7,8		5,7,8
12.	Endrin	4	5,7,8		5,7,8
13.	Endrin Aldehyde	4	5,7,8		5,7,8
14.	Heptachlor	4	5,7,8		5,7,8
15.	Heptachlor Epoxide	4	5,7,8		5,7,8
16.	Methoxychlor	4	5,7,8	Method 4:	5,7,8
17.	Endrin Ketone	4	5,7,8	Soxhlet Extraction	5,7,8
18.	BHC (Alpha)	4	5,7,8	or	5,7,8
19.	BHC (Beta)	4	5,7,8	Method 5:	5,7,8
20.	BHC (Gamma)	4	5,7,8	Soxhlet Extraction	5,7,8
21.	BHC (Delta)	4	5,7,8	or	5,7,8
22.	Oxy-chloredane	4	5,7,8	Method 6:	5,7,8
23.	trans-nonachlor	4	5,7,8	Column Extraction	5,7,8
24.	cis-nonachlor	4	5,7,8		5,7,8
25.	Demiton	4	5,7,8		5,7,8
26.	Guthion	4	5,7,8		5,7,8
27.	Malathion	4	5,7,8		5,7,8
28.	Parathion	4	5,7,8		5,7,8
29.	Mirex	4	5,7,8		5,7,8
30.	Hexachlorobenzene (HBC)	4	5,7,8		5,7,8
31.	PCA	4	5,7,8		5,7,8
32.	Dactal	4	5,7,8		5,7,8
33.	Toxaphene	10	5,7,8		5,7,8
34.	PCB 1016	10	5,7,8		5,7,8
35.	PCB 1221	10	5,7,8		5,7,8
36.	PCB 1232	10	5,7,8		5,7,8
37.	PCB 1242	10	5,7,8		5,7,8
38.	PCB 1248	10	5,7,8		5,7,8
39.	PCB 1254	10	5,7,8		5,7,8
40.	PCB 1260	10	5,7,8		5,7,8

(1) QMDLs:

The QMDLs in ug/kg wet weight are calculated as follows:

$$QMDL = A \times V/W$$

where A = concentration of lowest standard analyzed (ug/ml)
V = final extract volume (ml)
W = mass of biological tissue (kg)

pw:eh/SOP/SOP-TONY

TABLE 1. QUANTIFIABLE METHOD DETECTION LIMITS (QMDLs) FOR ORGANICS TARGET COMPOUND LIST (TCL) BASED ON 10 GRAM BIOLOGICAL TISSUES SAMPLE PER EACH COMPOUND CLASS (VOAs, BNAs, and Pesticides/PCBs)

The final extract volume (V) = 0.5, 1.0 and 5.0 ml for BNAs, Pesticides/PCBs and VOAs, respectively.

Calibration Standards

BNAs	VOAs	Pesticides	PCBs
5 ug/ml	1 ug/ml	0.04 ug/ml	0.1 ug/ml
10 ug/ml	5 ug/ml	0.1 ug/ml	0.25 ug/ml
20 ug/ml	10 ug/ml	0.2 ug/ml	0.5 ug/ml
50 ug/ml	20 ug/ml	0.5 ug/ml	1.0 ug/ml
80 ug/ml	50 ug/ml	1.0 ug/ml	2.0 ug/ml
120 ug/ml	80 ug/ml	2.0 ug/ml	3.0 ug/ml
160 ug/ml	120 ug/ml	2.5 ug/ml	5.0 ug/ml

(2) Extraction Methods:

Method 1 (Volatile compounds) - Vacuum distillation (ref. 1-5).

Method 2 (Semi-volatile compounds) - Soxhlet extraction with methylene chloride/methanol solvent mixture (2/1) followed by Liquid-Liquid Extraction and Gel Permeation Chromatography (GPC) clean up (ref. 5).

Method 3 (Semi-volatile compound) - Solvent extraction - the fish tissue is dispersed into acetonitrile solvent which is then dissolved in one (1) liter of 2% aqueous Na_2SO_4 solution. The aqueous acetonitrile, Na_2SO_4 mixture is extracted with hexane after appropriate pH adjustments with 6M NaOH and 6M HCl (ref. 6).

Method 4 (Pesticides/PCB's compounds) - Soxhlet extraction with hexane followed by Liquid-Liquid Partitioning with acetonitrile/petroleum ether mixture and florisil clean up (ref.7).

Method 5 (Pesticides/PCB's compounds) - Soxhlet Extraction with methylene chloride/methanol solvent mixture (2/1) followed by Liquid-Liquid Extraction, GPC clean up and solvent exchange to hexane (ref. 5).

Method 6 (Pesticides/PCB's compounds) - Packed Column Extraction with methylene chloride followed by GPC and florisil clean up and solvent exchange to hexane (ref. 8).

TABLE 2. COMPARISON OF QUANTIFIABLE METHOD DETECTION LIMITS (QMDLs) FOR TARGET ANALYTE LIST (TAL) METALS BASED ON 0.5 GRAM BIOLOGICAL TISSUES SAMPLE

		Furnace-AA		ICAP-AA		Flame-AA		ICP-MS		Sample Digestion			
Element		DL[1] (ug/l)	QMDL[2] (mg/l)	DL[1] (ug/l)	QMDL[2] (mg/l)	DL[1] (ug/l)	QMDL[2] (mg/l)	DL[1] (ug/l)	QMDL[2] (mg/l)	Hot Plate	Ref#	Microwave	R
Aluminum	Al	5.0	1.0	100	20.0	500	100	0.1	0.020	Method 3050	5,6,9-11	Method 3051	1
Antimony	Sb	5.0	1.0	100	20.0	---	---	0.02	0.004	Method 3050	5,6,9-11	Method 3051	1
Arsenic	As	5.0	1.0	100	20.0	---	---	0.4	0.080	Method 3050	5,6,9-11	Method 3051	1
Barium	Ba	5.0	1.0	1	0.2	1000	200	0.2	0.004	Method 3050	5,6,9-11	Method 3051	1
Beryllium	Be	0.5	0.1	1	0.2	25	5	0.1	0.020	Method 3050	5,6,9-11	Method 3051	1
Cadmium	Cd	0.2	0.04	10	2.0	25	5	0.07	0.014	Method 3050	5,6,9-11	Method 3051	1
Calcium	Ca	0.3	0.06	1	0.2	50	10	10.0	2.0	Method 3050	5,6,9-11	Method 3051	1
Chromium	Cr	1.0	0.2	10	2.0	50	10	0.02	0.004	Method 3050	5,6,9-11	Method 3051	1
Cobalt	Co	2.0	0.4	10	2.0	50	10	0.01	0.002	Method 3050	5,6,9-11	Method 3051	1
Copper	Cu	1.0	0.2	10	2.0	25	5	0.03	0.006	Method 3050	5,6,9-11	Method 3051	1
Iron	Fe	1.0	0.2	10	2.0	50	10	0.02	0.040	Method 3050	5,6,9-11	Method 3051	1
Lead	Pb	2.0	0.4	100	20.0	50	10	0.02	0.004	Method 3050	5,6,9-11	Method 3051	1
Magnesium	Mg	0.1	0.02	1	0.2	100	20	0.1	0.020	Method 3050	5,6,9-11	Method 3051	1
Manganese	Mn	0.5	0.10	1	0.2	25	5	0.04	0.008	Method 3050	5,6,9-11	Method 3051	1
Mercury	Hg	1.0	0.2	37	3.4	(0.2)*	(0.04)*	0.08	0.016	Method 3050	5,6,9-11	Method 3051	1
Nickel	Ni	3.0	0.6	10	2.0	50	10	0.03	0.006	Method 3050	5,6,9-11	Method 3051	1
Potassium	K	0.3	0.06	100	20.0	50	10	----	-----	Method 3050	5,6,9-11	Method 3051	1
Selenium	Se	5.0	1.0	100	20.0	---	---	1.0	0.200	Method 3050	5,6,9-11	Method 3051	1
Silver	Ag	0.5	0.1	10	2.0	25	5	0.04	0.008	Method 3050	5,6,9-11	Method 3051	1
Sodium	Na	0.05	0.01	10	2.0	50	10	0.06	0.012	Method 3050	5,6,9-11	Method 3051	1
Thallium	Tl	5.0	1.0	100	20.0	---	---	0.05	0.010	Method 3050	5,6,9-11	Method 3051	1
Vanadium	V	10.0	2.0	10	2.0	500	100	0.03	0.006	Method 3050	5,6,9-11	Method 3051	1
Zinc	Zn	0.1	0.02	10	2.0	25	5	0.08	0.016	Method 3050	5,6,9-11	Method 3051	1

(1) - The detection limits (DLs) in ug/l are lowest standard concentration analyzed.

(2) - The QMDLs in mg/kg wet weight are calculated as follows:

$$QMDL = A \times V/W$$

where A = concentration of lowest standard analyzed
V = final extract volume = 100 ml
W = mass of biological tissue

* For mercury: use flameless cold vapor technique only

pw:eh/SOP/SOP-TONY

TABLE 3. QUANTIFIABLE METHOD DETECTION LIMITS (QMDLs) FOR 2,3,7,8-TCDD/2,3,7,8-TCDF AND POLYCHLORINATED DIBENZODIOXINS (PCDDs) AND DIBENZOFURANS (PCDFs) BASED ON 10 GRAM BIOLOGICAL TISSUE SAMPLE

		QMDLs (ng/kg)[1] by SIM - GC/MS				EXTRACTION[4]	
PCDDs/PCDFs	COMPOUNDS	HRMS[2]	REF	LRMS[3]	REF	METHOD	REF
1	2,3,7,8-TCDD	2	14	10	15,16		14-16
2	1,2,3,7,8-PeCDD	5	14	50	15,16		14-16
3	1,2,3,6,7,8-HxCDD	10	14	100	15,16	Method 7:	14-16
4	1,2,3,7,8,9-HxCDD	10	14	100	15,16	Soxhlet	14-16
5	1,2,3,4,7,8-HxCDD	10	14	100	15,16	Extraction	14-16
6	1,2,3,4,6,7,8-HpCDD	20	14	200	15,16	or	14-16
7	* Total - TCDD	--	14	--	15,16	Method 8:	14-16
8	* Total - PeCDD	--	14	--	15,16	Column	14-16
9	* Total - HxCDD	--	14	--	15,16	Extraction	14-16
10	* Total - HpCDD	--	14	--	15,16		14-16
11	2,3,7,8-TCDF	2	14	10	15,16		14-16
12	1,2,3,7,8-PeCDF	5	14	50	15,16		14-16
13	2,3,4,7,8-PeCDF	5	14	50	15,16		14-16
14	1,2,3,6,7,8-HxCDF	10	14	100	15,16		14-16
15	1,2,3,7,8,9-HxCDF	10	14	100	15,16		14-16
16	1,2,3,4,7,8-HxCDF	10	14	100	15,16		14-16
17	2,3,4,6,7,8-HxCDF	10	14	100	15,16		14-16
18	1,2,3,4,6,7,8-HpCDF	20	14	200	15,16		14-16
19	1,2,3,4,7,8,9-HpCDF	20	14	200	15,16		14-16
20	* Total - TCDF	--	14	--	15,16		14-16
21	* Total - PeCDF	--	14	--	15,16		14-16
22	* Total - HxCDF	--	14	--	15,16		14-16
23	* Total - HpCDF	--	14	--	15,16		14-16

* Excluding the 2,3,7,8 - substituted congeners.

(1) QMDLs in ng/kg wet weight are estimated as follows:

a) Using 2,3,7,8-TCDD as an example (ref 15):

$$QMDL = \frac{[(An/A334) + (3 \times SE) - INT] \times C334}{RF322/334 \times K}$$

where:
- An = noise area in the 2,3,7,8-TCDD window for ion 322
- A334 = labeled internal standard peak area in the sample
- INT = the Y-axis intercept on the initial calibration curve
- C334 = labeled internal standard concentration
- K = constant to adjust for sample size and final volume
- RF322/334 = response factor for native/labeled 2,3,7,8-TCDD, the slop of the initial calibration curve
- SE = standard error of the estimate of the initial calibration curve

(1) b) Using homologous 2,3,7,8 - substituted PCDDs/PCDFs as an example (ref 14):

$$QMDL = (2.5 \times Au \times Q_{is})/(A_{is} \times W \times RF(n))$$

where, Au = sum of integrated ion abundances of quantification ions for unlabeled PCDDs/PCDFs

A_{is} = sum of integrated ion abundances of quanitification ions for labeled internal standards (IS)

Q_{is} = quantity (in pg) of internal standard added to sample before extraction

W = weight of sample in grams

RF(n) = calculated mean response factor for analyte n

(2) HRMS = high resolution mass spectroscopy

(3) LRMS = low resolution mass spectroscopy

(4) Extraction Methods:

Method 7 (PCDDs/PCDFs) - Soxhlet Extraction (ref. 14, 15). The sample is spiked with nine (9) isotopically labeled ($^{13}C_{12}$) PCDDs/PCDFs, and Soxhlet extracted with hexane/methylene chloride solvent mixture for 12 hours. The extract is then concentrated to about 5 mls, is subject to several columns clean up steps and solvent exchanged to hexane or isooctane for analysis (USEPA Method 8290).

Method 8 (PCDDs/PCDFs) - Column Extraction (ref 16) - The "Bio-Tissue" spiked with isotopically labeled compounds (PCDDs/PCDFs) are processed in a two part enrichment procedure and the PCDDs/PCDFs recovered by reverse elution with appropriate solvent (Toluene) solvent exchanged with hexane, followed by cleanup, volume reduction of extract and analysis by high-resolution gas chromatography/low-resolution mass spectrometry (HRGC/LRMS).

1. Volatile Organic Compounds (VOAs) Sample Preparation for "Bio-Tissues"

Method 1 - Vacuum Distillation (for details see literature references 1-5).

2. Semivolatiles (BNAs) Sample Preparation for "Bio-Tissues"

Method 2 - Soxhlet Extraction (refs. 4,5).

- Weigh 10 $\pm$ 0.01 gram homogenized "Bio-Tissue" sample, spike it with 10 ug surrogate standards (SS), add 30 grams anhydrous Na_2SO_4, mix well and quantitatively transfer to a precleaned Soxhlet thimble for extraction.

- Extraction:
  - o Place thimble into Soxhlet extractor.
  - o Add 20 ml methanol (or 20 ml acetic acid) slowly through thimble.
  - o Add 100 ml methylene chloride/methanol (2/1 by volume) mixture to round bottom flask of extractor.
  - o Connect water cooled condenser and extract for 24 hours (ca 60-90 cycles).
  - o Allow the system to cool and wash the extract via Liquid-Liquid Extraction procedure below.

- Liquid-Liquid Extraction

  - o Transfer the methylene chloride/methanol extract to a 1 liter separatory funnel containing 100 ml of 50 percent aqueous Na_2SO_4 solution at pH=2 ("Acidic aqueous phase").
  - o Rinse the Soxhlet extractor flask three times with 10 ml portions to of methylene chloride and add rinsates to separatory funnel.
  - o Extract the "acidic aqueous phase" and collect the methylene chloride layer.
  - o Re-extract the "acidic aqueous phase" twice more with 80 ml portions methylene chloride and add both extracts to the initial methylene chloride fraction.
  - o Adjust the pH of the "acidic aqueous phase" to 12 with 6N NaOH.
  - o Extract three times with 80 ml portions methylene chloride and combine all the methylene chloride layers with the previous fractions.
  - o Dry the total combined solvent extract by pouring through anhydrous Na_2SO_4 into a Kuderna-Danish (K-D) system containing two boiling chips.
  - o Rinse the Na_2SO_4 drying column with 30 ml methylene chloride directly into the dried extract in the K-D system.
  - o Attach a 3-ball macro Snyder column to the K-D system and concentrate the extract to 5 ml on a water bath at 80°C.
  - o Remove K-D system from the water bath, rinse the flask with 3 ml methylene chloride and collect rinsate in the concentrator tube.
  - o Concentrate extract in concentrator tube to 3 ml using a stream of purified N_2 gas (DO NOT allow extract to go to dryness) and cleanup extract using Gel Permeation Chromatograph y (see extract cleanup below).

- Extract Cleanup:

  - o Gel Permeation Chromatography (GPC) cleanup is required to separate the analytes from biological macromolecules.
  - o Transfer the 3-ml extract onto the GPC column via the filter holder to avoid particulates that might cause system blockage. Process extract and collect the cleaned extract in a 400 ml beaker (see refs 4 and 5 for details).
  - o Transfer the clean extract to a K-D system and concentrate to 1 ml.
  - o Analyze the 1 ml extract using GC/MS.

- Method 3 - Modified Solvent Extraction (ref 6)

  - o Weigh 10 $\pm$ 0.01 gram "Bio-Tissue" sample and quantitatively transfer into 100 ml centrifuge tube.
  - o Add 20 ml acetonitrile (CH_3CN).
  - o Insert tissumizer into centrifuge tube and disperse "Bio-Tissue" into solvent for about 1 minute.
  - o Centrifuge and decant solvent (CH_3CN extract) into a 2-liter separatory funnel containing 1 liter of 2% aqueous Na_2SO_4 solution.
  - o Repeat the "Bio-Tissue" dispersion step twice more using 20 ml portions of acetonitrile, centrifuge and combine the CH_3CN extract by decanting into 1-liter 2% aqueous Na_2SO_4 solution in separatory funnel.
  - o Adjust pH to 11 with 6N NaOH and add 60 ml hexane.
  - o Extract the aqueous acetonitrile solution with 60 ml hexane, and separate top organic (hexane) layer and pour through anhydrous Na_2SO_4 into a K-D system.
  - o Repeat extraction twice more with 60 ml each of hexane and combine into K-D system.
  - o Adjust the pH of aqueous acetonitrile to 2 using 6N HCl.
  - o Extract the aqueous acetonitrile (CH_3CN) solution 3 times with 60 ml hexane portions and combine the extracts after passing through anhydrous Na_2SO_4 into K-D system.
  - o Concentrate combined extracts to the 3 mls and proceed with GC-MS analysis.

  NOTE: The method should be modified as follows:

  1. Determine percent fat (lipid) gravimetrically.
  2. Gel permeation chromatography (GPC) cleanup should be used before GC/MS analysis.
  3. The clean extract from GPC cleanup should be concentrated to 1 ml solvent exchanged with methylene chloride.
  4. Substitute Methylene Chloride for Hexane.
  5. Substitute Methylene Chloride/Methanol mix for acetonitrile.
  6. Spike sample with surrogate standards.

3. Pesticides/PCBs Sample Preparation for "Bio-tissues"

   Method 4 - Soxhlet Extraction (ref 7):

   - Weigh 10 $\pm$ 0.01 gram homogenized "Bio-Tissue" sample into 250 ml pyrex beaker
   - Add 150 g anhydrous Na_2SO_4, mix thoroughly with stainless steel spatula, cover with

aluminum foil and allow to stand overnight in a desiccating cabinet.

- Transfer quantitatively the mixture into a coarse sintered glass (size 23) thimble and Soxhlet extract with 500 ml hexane for 24 hours.
- Concentrate hexane extract to about 5 ml in K-D system and transfer quantitatively to a tared 15 ml tube (for lipid determination).

- Lipid Determination:

  - o Concentrate the hexane extract in the tared 15 ml tube to near dryness under gentle stream of nitrogen.
  - o Allow the sample to air-dry for 24-36 hours to remove traces of hexane.
  - o Weigh tared tube and sample to constant weight and calculate percent lipid gravimetrically.

- Liquid-Liquid Partitioning (Acetonitrile/Petroleum ether)

  - o Add 5 ml petroleum ether to the weighed lipid sample and saturate with acetonitrile (CH_3CN) by shaking.
  - o Transfer the mixture quantitatively to a 50 ml centrifuge tube rinsing the tared tube three (3) times with 4 ml portion of CH_3CN saturated petroleum ether and combining the rinsates with the mixture.
  - o Add 30 ml of petroleum ether saturated CN_3CN to centrifuge tube and shake vigorously for 2 minutes.
  - o Centrifuge to facilitate phase separation and carefully transfer the lower CH_3CN layer with a disposal Pasteur pipette into 1 liter separatory funnel containing 500 ml water, 30 ml saturated aqueous NaCl solution, and 100 ml petroleum ether.
  - o Repeat the CH_3CN extraction three additional times, transferring the CH_3CN layer to the 1 liter separatory funnel following each phase separation.
  - o Stopper the separatory funnel and shake vigorously for 2 minutes.
  - o Following phase separation, place aqueous layer in a liter bottle, and place the organic layer in a separate bottle.
  - o Return aqueous phase to its original separatory funnel and re-extract with 100 ml petroleum ether by shaking as before.
  - o Discard aqueous layer and combine the first petroleum ether extract with the second in the separatory funnel.
  - o Wash the combined petroleum ether extracts twice using 100 ml portion each of water containing 5 ml saturated aqueous NaCl solution shaking for 30 seconds.
  - o Discard aqueous phase after each wash and transfer the combined petroleum ether extracts to a K-D system and concentrate to 5 ml final extract volume.
  - o Proceed to column cleanup step.

- Sample Extract Cleanup:

1. Florisil Column - prepare the column by adding adsorbent to a 4 inch height in a 22 mm i.d. chromatographic glass column, topping with 1 cm anhydrous Na_2SO_4.

   - o Prewet the Florisil with 50 ml petroleum ether and transfer the sample to the column along with three 2 ml each petroleum ether rinses.
   - o Elute the sample on-column with 200 ml of 6% diethyl ethel/petroleum ether (Fraction I) followed by 200 ml of 15% diethyl ether/petroleum ether (Fraction II).

- o Solvent exchange Fraction II with hexane by evaporating to near dryness using a K-D system and nitrogen blow down (on N-evap) and make up to 1 ml (or 10 ml) with hexane and analyze by capillary column GC/ECD.
- o Concentrate Fraction I to 5 ml volume using K-D system and separate the PCBs from other pesticides through silicic acid cleanup as follows:

2. Silicic Acid (Silicar CC-4 Mallinckroft) column is prepared as follows:

- o Lightly plug the chromatographic column tube (Houston Glass Fabrication Co., #15212) with glass wool and add 1 cm anhydrous Na_2SO_4.
- o Prior to use prepare 5 grams of silicic acid by weighing into appropriate size test tube, cover with aluminum foil and store in a 130°C oven (NOTE: adsorbent should be kept in oven for one week) until ready for use.
- o Transfer 5 grams of silicic acid from the 130°C oven (while still hot) to the column and add 1 cm anhydrous Na_2SO_4 to the top of the salicic acid.
- o Rinse the column with 15 ml hexane and discard rinsate.
- o Transfer the 5 ml sample extract (Florisil Fraction I) to column - Rinse the sample tube with 5 ml hexane and add it to the column.
- o Elute column and collect each fraction as follows:

  Fraction 1 - 20 ml petroleum ether
  Fraction 2 - 100 ml petroleum ether
  Fraction 3 - 20 ml mixed solvent (1 ml CH_3CN, 10 ml hexane and 80 ml CH_2Cl_2)

- o Solvent exchange each Fraction separately with hexane by evaporating to near dryness using K-D system and N-Evap and make up to 1 ml or 10 ml final volume with hexane.
- o Analyze by GC/ECD.

Method 5 - Soxhlet Extraction (ref 5):

Weigh 10 $\pm$ 0.01 gram homogenized "Bio-Tissue" sample. Add 30 grams anhydrous Na_2SO_4, mix well and quantitatively transfer to a precleaned Soxhlet thimble for extraction.

Extraction:

- o Place thimble into Soxhlet Extractor.
- o Add 20 ml methanol (or 20 ml acetic acid) slowly through thimble.
- o Add about 100 ml methylene chloride/methanol (2/1 by volume) mixture to round bottom flask of extractor.
- o Connect a water cooled condenser and extract for 24 hours (ca 60-90 cycles).
- o Allow the system to cool and wash the extract via Liquid-Liquid Extraction.

Liquid-Liquid Extraction:

- o Transfer the methylene chloride/methanol extract into a 1 liter separatory funnel filled with 100 ml of 50 percent aqueous Na_2SO_4 solution at pH=2 ("Acidic aqueous phase").

- o Rinse the Soxhlet extractor flask three times with 10 ml portions of methylene chloride and add rinsates to separatory funnel.
- o Extract the "acidic aqueous phase" and collect the methylene chloride layer.
- o Re-extract the "acidic aqueous phase" twice more with 80 ml portions of clean methylene chloride and add both extracts to the initial methylene chloride fraction.
- o Adjust the pH of the "acidic aqueous phase" to 12 with 6N NaOH.
- o Extract three times with 80 ml each methylene chloride and combine all the methylene chloride layers with the previous fractions.
- o Dry the total combined solvent extract by pouring through anhydrous Na_2SO_4 into a Kuderna-Danish (K-D) system containing one or two boiling chips.
- o Rinse the Na_2SO_4 drying column with 30 ml methylene chloride directly into the dried extract in the K-D system.
- o Attach a 3-ball macro Snyder column to the K-D system and concentrate the extract to 5 ml on a water bath at 80°C.
- o Remove K-D system from the water bath and rinse the flask with 3 ml methylene chloride draining into the concentrator tube.
- o Concentrate extract in concentrator tube to 3 ml using a stream of purified N_2 gas (DO NOT allow extract to go to dryness) and cleanup extract using GPC.

- Extract Cleanup

- o Gel Permeation Chromatography (GPC) cleanup is required to separate the analytes from biological macromolecules.
- o Transfer the 3-ml extract onto the GPC column via the filter holder to avoid particulates that might cause system blockage. Process extract and collect the cleaned extract in a 400 ml beaker (see refs 4 and 5 for details).
- o Transfer the clean extract to a K-D system and concentrate to 1 ml solvent exchanging with hexane (the extract MUST NOT go to dryness). Proceed with alumina cleanup.

Alumina Column Cleanup (removes polar interferents prior to GC/ECD analysis

- o Transfer the 1.0 ml hexane extract to the top of alumina column with a disposable Pasteur pipet and collect the eluate in a 10 ml K-D concentrating tube.
- o Rinse the original extract concentrator tube with 1 ml hexane and transfer the rinsates to the alumina column.
- o Elute the column with an additional 9 ml hexane (NOTE: DO NOT allow column to go dry).
- o Concentrate the eluate to 1 ml final extract volume using a micro-snyder column and N_2 blow down procedures.
- o Analyze extract for Pesticides/PCBs using GC/ECD.

Method 6 - Packed Column Extraction (ref 8)

- Weigh 10 $\pm$ 0.01 gram "Bio-Tissue" sample, add 40 grams anhydrous Na_2SO_4 and mix well.

- Grind the mixture to a fine powder and pack it into a chromatographic column (Ace glass, 30 cm x 2 cm i.d.) fitted with a 200 ml reservoir and removable Teflon® stopcock.

- Extract the sample with 200 ml methylene chloride through the packed column adjusting the flow to 3 ml/min.

- Collect lipid extract in a 250 ml round bottom flask fitted with 10 ml reservoir at bottom.

- Concentrate the extract to 2-3 ml using a rotary evaporator (or K-D system).

- Dilute extract to 10 ml with a 1:1 mixture of cyclohexane/methylene chloride. Proceed with lipid determination and GPC cleanup.

- LIPID DETERMINATION

  - o Transfer 1 ml of the 10 ml extract into a preweighed 7.8 gr (2 dram) vial and evaporate the solvent to dryness overnight.
  - o Determine percent lipid gravimetrically.
  - o Use remaining 9 ml extract for GPC cleanup.

- GPC CLEANUP AND FRACITONATION

  - o An automated Gel Permeation Chromatography (GPC) system is used to separate the organochlorine Pesticides and PCBs from "Bio-Tissue" oils.
  - o Use 60 gram SX-3 Bio Beads® gel resin (Bio Rad) with 1:1 mixture of cyclohexane/methylene chloride.
  - o Pack the resin into a 2.5 cm i.d. x 48 cm glass column fitted with two adjustable plunges (Glenco Scientific).
  - o Place the column onto an automated GPC Autoprep 1001 Chromatograph (ABC Labs) and pump solvent through column at 5 ml/min. Use 5 ml (but NO more than 0.5 g lipid) of sample extract onto GPC column
  - o Discard the first 150 ml of eluate and collect the next 150 ml eluate in a 250 ml double reservoir flask
  - o Rotoevaporate GPC eluate to 1 ml and subsequently dilute to 5 ml with Hexane. Proceed with Florisil® cleanup.

- FLORISIL CLEANUP/FRACTIONATION

  - o Florisil® Column chromatography is used to further cleanup the fatty acid extract and fractionate initial non-polar compounds.
  - o Florisil® column (Ace Glass, 1 cm i.d. x 30 cm) fitted with 75 ml reservoir at top is prepared by placing 1 cm anhydrous Na_2SO_4 layer on a pledget of glass wool in the chromatography column bottom, followed by the addition of 5 gram 60/80 mesh Florisil® (Fisher Scientific) activated at 130°C for 16 hours, and topping it with another 1 cm layer of anhydrous Na_2SO_4.
  - o Wash column with 20 ml hexane and discard washings.
  - o Quantitatively transfer the GPC concentrate to top of column when the hexane layer reaches the top of the upper Na_2SO_4 layer, and allow to drain through the Florisil®.
  - o Wash column wall with 5 ml eluant (5% diethylether in petroleum ether).
  - o When the eluant reaches the top of Florisil, add 35 ml to 5% diethylether/Petroleum ether eluate mixture and collect it for further separation.
  - o Polar compounds (dieldrin, Dacthal®, and endrin) are collected with 40 ml of 40% diethylether in petroleum ether mixture (Fraction I).
  - o PCBs are separated from most pesticides by silica gel chromatography. Glass wool is placed at bottom of silica gel column (30 cm x 1 cm i.d.) followed by 1 cm

anhydrous Na_2SO_4, 5 gram silica gel (activated at 130°C) and 1 cm additional layer of anhydrous Na_2SO_4.

- o The silica gel column is washed with 20 ml hexane and discard the hexane.
- o When the hexane wash reaches top of Na_2SO_4 the sample is added to the column and rinsed with 5 ml of first eluant and allowed to sink into the bed.
- o The rest of the eluant is added and allowed to drip into a 125-ml double reservoir flask.
- o The first eluate (PCB fraction) contain PCBs, HBC (hexachlorobenzene), heptachlor, aldrin, mirex and most p,p'-DDE.
- o The second eluate (pesticide fraction) contain the rest of the DDE, benzene hexachloride (BHC) isomers, toxaphene, DDT and its homologs, chlordane (including nonachlor isomers), oxychlordane, heptachlor epoxide, methoxychlor, and pentachloroanisole (PCA).
- o In general, 35-45 ml of PCB element and 25-35 ml of pesticide eluant are needed.
- o The eluate volumes are reduced by rotoevaporation and resulting concentrates diluted to 5 ml with isooctane prior to gas-liquid chromatography (GLC) and GC-ECD analysis.

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APPENDIX B
STANDARD OPERATING PROCEDURES

COLLECTION AND PROCESSING OF MUSKRATS (Ondatra zibethicus)

1.0 SCOPE AND APPLICATION

This document describes procedures for the collection and processing of muskrats in ecological assessments of contaminated wetlands. As consumers of plant material, muskrats can provide important information on bioaccumulation of contaminants in wetland food chains. Collected specimens may be used for analysis of (1) contaminant levels in body tissues, (2) histopathological effects of contaminants, and (3) demographic data as a measure of population level impacts.

2.0 METHOD SUMMARY

Before trapping, the area of potential impacts should be identified, and one or more reference areas selected with which to compare results. Trap locations should be then selected on the basis of habitat availability and evidence of muskrat activity. Each trap location should be marked in the field and on a corresponding map or aerial photo. Spring traps such as the Conibear 110 are used to collect specimens, and are generally set at the openings of burrows, and along muskrat runways and channels. Traps should be checked within 12 hours of setting. While the Conibear 110 is a kill trap, some situations may require sacrificing the animal by cervical dislocation if it is still alive when the trap is checked. Animals collected are tagged through the right hind foot for documentation purposes, and stored on ice in coolers until processing. Field data sheets are completed at the time of collection, describing the location, and conditions under which each specimen was collected.

Standard metric measurements (total length, tail length, hind foot length, body weight), shall be taken on each specimen before processing. Specimens are then skinned, and each skin is tagged and preserved for documentation. Subsequently, each specimen is dissected, and gross necropsies conducted before target organs are collected for tissue analysis. Specific target organs, such as the liver, or reproductive organs, shall be weighed and measured at this time, in accordance with project objectives. Depending upon analyses to be conducted, tissue samples may be preserved in solution in glass jars, or wrapped in aluminum foil and stored on dry ice or in a freezer. As each animal is processed, a data sheet should be completed, including necropsy results, metrics, age class and sex of the individual, organs or tissues preserved, and other information deemed pertinent.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING AND STORAGE

The skin, target organs and carcass from each specimen are each preserved according to its own standard procedure. If removed in the field, the skin may be preserved on dry ice, or else it may be immediately prepared for drying. In either case, it should be labelled

with its appropriate animal number immediately after removal from the animal. It should then be scraped free of all flesh and fat on a skinning board, before stretching onto a standard mammal drying rack. The stretched skins should be hung in a dry, well ventilated area. Care should be taken not to allow skins to be exposed to flying insects. Skins should be dried for a minimum of 3-5 days. Dried skins should then be stored in a cool, dry place, such as in specimen drawers with napthalene chips.

Target organs collected may vary with the study objectives. Liver and kidneys are often collected for analysis of contaminants. These, once removed, should be immediately weighed, and the amount required for analysis wrapped in aluminum foil, labelled with a waterproof pen, and stored on dry ice or in a freezer at 0^0 C. The amount required for analysis may vary with analytical procedures as well as contracting laboratories.

Liver, kidneys, and other organs may be collected for gross histopathological analysis to determine effects of contaminant exposure on tissues. These should be measured before being preserved in labelled glass jars filled with 10% buffered paraformaldehyde solution. The solution should be changed within 10 days, and refilled with fresh solution. Waste solution should be disposed of according to SOP#3013, REAC Laboratory Safety. Sections to be sent for histopathological analysis may be placed into labelled smaller jars, or scintillation vials filled with 10% buffered paraformaldehyde. Reproductive organs should likewise be measured before preservation. Ovaries may be preserved in 10% buffered paraformaldehyde. However, testes should be preserved in individual scintillation vials filled with Bouin's solution, after a longitudinal incision is made in the right testicle, and a lateral incision is made in the left one. This facilitates tissue fixation and allows laboratories to distinguish between right and left testes. The Bouin's solution should be changed within 48-72 hours, and replaced with a solution of 70% Ethyl Alcohol.

Once received from the subcontracting laboratory, paraffin blocks from histopathological analyses should be stored at 4^0 C. Microscopic slides of histopathological characteristics received from labs should be stored in drawers or cabinets.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

Trapping of muskrats may lead to mortality of non-target species. However, the most likely species to be trapped unintentionally is the Norway rat (Rattus norvegicus), an exotic pest species. Specimens trapped unintentionally will be retained and analyzed if necessary, depending upon project objectives.

Extreme temperature conditions can alter tissue characteristics, making tissue unsuitable for analysis. Exposure of specimens to extreme cold for extended periods can cause tissue to freeze, making histopathological analysis difficult, and extreme heat can result in rapid decomposition of tissue. Therefore, intervals between trap checks should be shortened under such conditions.

In some cases, such as occasional juvenile animals, less tissue may be present within the organs than is required by analytical methods to determine contaminant levels or histopathological effects. To deal with this problem, target tissues from individuals collected in the same area may be pooled.

5.0 EQUIPMENT/APPARATUS

work plan	dissecting trays	machete
maps	4 oz. glass jars	scalpels
data sheets	aluminum foil	scalpel blades
compass	Conibear 110 traps	25.4 or 12.7 cm straight blade scissors
tape measure	survey flags or tape	scintillation vials
camera/film	electronic scale	triple beam balance
teflon tags	15 cm ruler	bone scissors
surgical gloves	first aid kit	safety equipment as per health and safety plan
hand scale	dry ice	15.2 or 20.3 cm toothed thumb forceps
large ziploc bags	Bouin's solution	10% buffered paraformaldehyde
skinning knives	Visqueen sheeting	waterproof marking pens
flesh beams	8 oz. glass jars	dissecting microscope
large coolers	skin stretchers	4 ft. plaster lathes
recurved scissors	wet ice	3/4" x 3 1/2" aluminum tags
heavy-duty twine	clipboard	heavy-duty serrated clamps
honing stone	rubber aprons	5 gal. plastic buckets

6.0 REAGENTS

A 10% buffered paraformaldehyde solution should be used to preserve all tissues except for testes for histological analysis. The solution is prepared as follows:

- 20 g paraformaldehyde
- 0.5 g sodium bicarbonate (Na_2CO_3)
- 500 ml water

Under an aerated laboratory hood, mix together the paraformaldehyde and sodium bicarbonate powders. Add the powdered mixture to hot tap water and stir vigorously until all the powder goes into solution. The solution may then be poured through a funnel into labelled plastic bottles for use.

7.0 PROCEDURES

7.1 Office Preparation

A. An approved health and safety plan is required prior to fieldwork. Personnel handling muskrats should have had a tetanus shot within 3 years prior to sampling.

B. A work plan describing study objectives, methodology and budget must be prepared in accordance with EPA/REAC SOP #2014, Quality Assurance Work Plan Preparation. Pertinent background information such as topographic maps, soil survey maps, previous site reports, and aerial photographs should be reviewed at this stage.

C. Obtain necessary sampling and monitoring equipment (Appendix A). Ensure that all equipment has been decontaminated, and is in working order. Traps may be cleaned with water or utensils, but chemicals or detergent should not be used. All traps should be inspected, as adjustment of the sensitivity of the trap mechanism may be necessary. Brand new traps must be cured well in advance of trapping activities. Curing a trap is done in three stages. First, the oil is washed off the trap by rinsing it in near boiling water with a mild degreaser (boiling water may damage the tempered steel). Next, the trap is set outside

for approximately one week, to allow it to acquire a coat of rust. Then the trap is soaked in near boiling water with staghorn sumac (Rhus typhina) heads, black walnut (Juglans nigra) hulls, or commercial dye to give the traps a natural scent and/or a dark pigment. After curing, a numbered aluminum tag should be placed on the handle of each trap.

D. Contact carrier services and confirm shipping requirements and restrictions for equipment and samples.

E. Confirm holding times of samples in the field, detection limits of contaminants of concern, and any other analytical requirements with the client, as well as quality assurance personnel, subcontracting laboratories, and other regulatory agencies or personnel involved.

F. Prepare field and analytical schedules and coordinate with staff, client and other regulatory authorities where appropriate.

G. Prior to fieldwork, obtain a scientific collection permit from the appropriate state agency.

7.2 Field Preparation

A. Identify local suppliers of field expendables (e.g. wet and dry ice), and local drop-off points of overnight delivery services.

B. A general site survey should be conducted, in accordance with the Health and Safety Plan requirements.

C. Identify on-site sampling areas, and at least one reference area for comparison. The reference area selected should be as close as possible to the site, yet be outside of any site influences. It should also have similar habitat features to the study site, and be free of contamination. An example would be a marsh located upstream of the site, within the same watershed.

D. Determine where and how specimens collected will be processed. If chemical analyses of tissue are to be conducted, then specimens should be skinned and dissected in an enclosed area, such as in a mobile trailer. Otherwise, skinning may be done in the field on a portable stand constructed of wood. Measurements and dissection may be done on portable tables, illuminated by generator-powered lamps in the back of a truck if conditions permit (good weather, daylight, no public onlookers).

7.3 Muskrat Collection

A. The number of traps set, and number of trap nights should be determined in accordance with the study objectives. For example, if adults are required for analysis, and most of the animals trapped are juveniles, then the intensity of trapping effort may have to be increased in the course of the study. Similarly, if equal numbers of males and females are desired for analysis, and the population consists largely of males, the number of traps and/or trap nights may have to be increased. Generally, trapping effort is a function of the number of animals required, and the population density of muskrats in the study marsh.

B. Trap locations should be clearly marked in the field with a 4 ft. section of plaster lathe, labelled with the location number by a water-proofed marker, and marked with a piece of surveyor's flagging tape, also labelled with the location number. Trap locations should be noted on a map or aerial photo overlay while the traps are being set.

C. Trap locations should be selected according to logistical considerations, as well as muskrat life history characteristics. Muskrats live in the banks of channels, and may also build conical huts. To increase trapping success, trap locations may be concentrated in these areas. Other potential trap locations include muskrat feeding areas, and frequently travelled pathways, and slides.

D. During trapping activities, disturbance of the habitat should be kept to a minimum. Late autumn, winter and early spring are the most favorable seasons for trapping, as muskrats are relatively sedentary, and tend to concentrate near their dens and huts. Traps should be set in late afternoon, and checked the following morning, to minimize losses to scavengers, or tissue degradation as a result of temperature extremes and/or decomposition.

E. Traps should be oriented and placed in such a fashion that the muskrat will trigger it, but that it will still be able to snap closed effectively. The trap may be placed horizontally or vertically to facilitate muskrat passage through the trap, but in either case, the 4 ft. section of plaster lathe should be used to support it. This can be done by placing the bottom ten inches of the lathe through the trap handle, and wedging it tight. The handle is then oriented 90^0 from its normal position, so that the trap rests soundly against the lathe. In addition to providing trap support, this will reduce trap displacement or loss.

F. Once the trap is set, the trap number, time, weather, date, trapper's name and location will be documented in a logbook. The location will also be drawn on a field map depicting the precise location of the trap.

G. All traps will be checked during early morning hours, unless the site is subject to tidal influence. In this case, traps should be set and checked during low tide. Traps should be checked in the order in which they were set to avoid skipping traps or trap loss. All traps unsuccessfully sprung should be documented, along with any sign of tracks, fur, predators, etc.

H. All specimens collected should be labelled immediately upon retrieval at each trap location. Once removed from the trap the specimen should be tagged with an aluminum tag affixed to the animal through a hole made in the right hind foot with a sharp probe or forceps. Each tag should be labelled with a code denoting the project, trap area, trap number and animal number (e.g., the fourth animal caught during the Kin-Buc project, in Area IV, trap 34, would have the following code written on the tag: KB-AIV-34-4). When the specimen is retrieved, information on its age class, sex, and condition, as well as the time, date and weather conditions should be recorded on a field data sheet, as well as in a field notebook.

I. After removal of the specimen from the trap, the trap should be cleaned of any fur or blood and reset. The specimen may then be placed temporarily into a 5 gal. plastic bucket, while checking the remaining traps. Only specimens captured from the same sampling area may be retained in the same sample container, to avoid possible cross-contamination. Specimens should be placed on wet ice as soon as possible.

7.4 Initial Processing

A. All muskrat specimens should be brought to a field staging area after as soon as possible after collection. Specimens will then be retained in coolers on wet ice until being processed. Specimens will be weighed, sexed, aged and checked for any gross abnormalities and

ectoparasites. Parameters to be measured include total length, tail length and right hind foot. Specimens should then be processed on the same day as retrieved from their respective trap.

B. Specimens should be skinned, and the skins dried and labelled for documentation purposes. The following skinning procedures may be used. A heavy duty clamp may be used to hold the carcass by the tail or hind feet. All individuals are then "cased" by making incisions at the base of the tail and the two hind feet at the fur line. The pelt is then cut from the heel of each hind foot to the anus, and the pelt is peeled down the body, cutting connective tissue where necessary.

C. Once the pelt has been removed, it is pulled over a fleshing beam and cleaned of excess flesh with a fleshing knife. It is then stretched over a stretching frame and allowed to dry for one to two days in a dry, 70° F room. If the pelt cannot be fleshed and dried immediately, then it should be rolled fur side out, placed in a plastic bag, and frozen. Pelts may be aged as adult or juvenile by observing the dark and light color patterns of the underside of the stretched muskrat pelt. Bilateral patterns indicate juveniles, while random patterns indicate adults.

7.5 Necropsy and Dissection

A. Upon removal of the pelt, partial necropsies should be performed on all specimens, and gross observations should be documented. First, a check of the carcass for any surficial or orificial abnormalities should be conducted. The specimen should be then be palpated from the anterior to the posterior end, and any swelling caused by internal fluids, swollen organs or other masses should be noted on the data sheet. The dimensions, color, location, physical appearance and number of abnormalities should be included in the description. Following documentation, any abnormality should be carefully excised and fixed in 10% buffered paraformaldehyde. After fixation, the abnormality should be weighed and submitted for histopathological analyses.

B. Each specimen should then be dissected according to the following procedures, taken from Necropsy Guide: Rodents and the Rabbit[1] (Feldman and Seeley 1988).

1. Collection of the Reproductive Tract

a. Male Reproductive System

Cut into the abdominal wall just above the penis. Take caution not to cut too deeply in order to avoid damage to internal organs. Extend laterally and anteriorly up both sides of the abdominal cavity to the rib cage. Reflect the abdominal wall up towards the rib cage. The abdominal cavity will now be exposed. Scan the abdomen for gross abnormalities. Remove the testes from the scrotum. Sever the gubernaculum testis (a fibrous connection between the scrotum and the tail of the epididymis). Next, sever the distal end of the vas deferens.

Separate the vas deferens, epididymis, and testis. Clean the epididymis and testis using forceps and a scalpel. Separate the right epididymis and testis, while leaving the left epididymis and testis partially attached for identification purposes. Preserve the organs in Bouin's solution and store in scintillation vials. Record the organ weights to the nearest 0.01g after fixation is complete. For example: A 30.00g testis from the left would be

recorded as "L30.00". While cleaning the tissue, be alert for abnormalities, especially differences in the sizes of the testes. Repeat the above steps for the other testis.

Anteriorly reflect the intestines. At this point, the urinary bladder, prostate gland, and seminal vesicles should be exposed. Using dissecting scissors, cut the pubic symphysis (the cartilaginous connection under the center of the pubis above the base of the penis). Using forceps, gently pull the penis upward and carefully dissect the connective tissue from the urethra and beneath the prostate gland. Place the excised product on a moist paper towel. (This slows the organs from drying out and prevents tissue from sticking to any surfaces.) Separate the seminal vesicles from the rest of the organs. Preserve the seminal vesicles. Weigh the seminal vesicles after fixation is complete.

b. Female Reproductive System

Cut into the abdominal wall just above the vulva. Take caution not to cut too deeply in order to avoid damage to internal organs. Extend laterally and anteriorly up both sides of the abdominal cavity to the rib cage. Reflect the abdominal wall up towards the rib cage and remove. The abdominal cavity will now be exposed. Scan the abdomen for gross abnormalities.

Using fine scissors, cut the pubis symphysis located under the center of the pubis. Dissect the posterior end of the vagina by cutting the skin between the vulva and the anus. Do not cut into the rectum. Gently pull the vagina upward and sever the thin connective tissue between the vagina and the rectum. Cut anteriorly to the cervix. At this point, begin cutting the mesentery supporting the uterine horns up to the ovaries. Gently sever the connective tissue between the ovaries and the kidneys, and lift out the reproductive tract onto a moist paper towel. Check the reproductive tract for abnormalities. Separate the uterus and ovaries intact. Make the separation adjacent to the distal side of the cervix from the uterus. Preserve the uterus and ovaries. Separate and weigh the uterus and ovaries after fixation is complete. Make note of any abnormalities, uterine scars, etc.

If embryos are present, note how many are in each uterine horn. Usually the embryos are of similar size and development. If this is not the case, note differences in detail. Take the measurements of one of the embryos which is representative of the mean. Record the embryo length and diameter to the nearest 1.0 millimeter. Prior to preserving the embryos, split each embryo at the distal end from the placenta to facilitate fixation. . Weigh the embryo after fixation is complete.

2. Collection of the Spleen and Duodenum

In order to retrieve the spleen, it is necessary to first remove the digestive tract. Gently pull down on the stomach and sever the connective tissue between the stomach and the caudate lobe of the liver. Sever the esophagus just above the stomach. Using forceps lift the esophagus just above the stomach and sever the bile duct and the remaining connective tissue between the liver and the stomach. Continue lifting the stomach upward and sever the mesentery between the intestines and the dorsal body wall. Do not cut any large blood vessels in this region. Complete the digestive tract excision by cutting around the anus and spreading the entire tract onto a saline moistened paper towel.

Gently separate the spleen from stomach connective tissue using forceps and a fine scalpel. Clean and place the spleen into preservative. Weigh the spleen after fixation is complete.

Sever the duodenum at the base of the pyloric sphincter and prior to the transverse section of the jejunum. Remove the contents of the duodenum with gentle pressure then preserve the tissue.

3. Collection of the Liver, Kidney and Adrenal Glands

Carefully grasp the connective tissue under the medial lobe of the liver and sever the esophagus and blood vessels going into the diaphragm. Sever any remaining connective tissue attached to the liver.

Cut two liver tissue sections starting at the distal end of the medial lobe. The sections should be cut 1.0 centimeter towards the center of the lobe, and be 0.5 cm thick. Cut each section using a scalpel and handle carefully. After the sections are taken, place them in preservative. The remaining liver is to be wrapped in aluminum foil and placed on dry ice. This liver tissue will be sent to a subcontract laboratory for PCB residue, percent lipids, and TAL metals analysis.

The right adrenal gland may be located slightly more anterior and closer to the vena cava than the left adrenal gland. Females may also have larger adrenal glands than males. When removing adrenal glands, grasp the adrenal artery and vein with forceps and sever the fatty tissue around the gland. After the adrenal gland is removed, clean and place into preservative. Weigh the adrenal gland after fixation is complete. Record weight and location (right/left) in a manner similar to the reproductive system.

Grasp the renal artery and vein of the right kidney with forceps. Sever the vessels with scissors and lift up the kidney while cutting the fatty connective tissue. Clean the kidney. Make horizontal incisions on the right kidney. The incisions facilitate fixation and can be used to identify the right kidney from the left kidney.

The left kidney is to be removed in the same manner. Make vertical incisions in the left kidney. This will facilitate fixation and identify the left kidney from the right kidney.

Place both kidneys in preservative. Weigh the kidneys after fixation is complete.

4. Collection of the Thymus and Lungs

In order to gain access to the thymus, the thoracic cavity must be opened. Using a pair of dissecting scissors, cut a slit under the sternum. then cut through the cartilaginous portion of the ribs anteriorly to the neck. Do this on both sides of the sternum. Spread the rib cage apart. Remove the ventral rib cage by making an anterior cut along each of the lateral sides of the rib cage. The thymus is a somewhat translucent, fragile organ located at the base of the trachea, above the heart.

Carefully, using fine scissors, remove the thymus by severing the anterior base of the organ. Clean and place the thymus in preservative. Weigh the thymus after fixation is complete.

Carefully slide a blunt probe under the right lung. Gently lift the lung lobe and sever all vessels and bronchi attached to the lobe. Place the lung lobe in preservative.
E. Target organs collected may vary with the study objectives. Liver and kidneys are often collected for analysis of contaminants. These, once removed, should be immediately weighed, and the amount required for analysis wrapped in aluminum foil, labelled, and stored on dry ice or in a freezer at 0^0 C. The amount required for analysis may vary with analytical

procedures as well as contracting laboratories.

C. Liver, kidneys, and other organs may be collected for gross histopathological analysis to determine effects of contaminant load on tissues. These should be measured (and results recorded) before being preserved in labelled glass jars filled with 10% buffered paraformaldehyde solution. The solution should be changed within 10 days, and refilled with fresh solution. Waste solution should be disposed of according to SOP#. Sections to be sent for histopathological analysis may be placed into labelled smaller jars, or scintillation vials filled with 10% buffered paraformaldehyde. Reproductive organs should likewise be measured before preservation. Ovaries may be preserved in 10% buffered paraformaldehyde. However, testes should be preserved in scintillation vials filled with Bouin's solution, after a longitudinal incision is made in the right testicle, and a lateral incision is made in the left one. This facilitates tissue fixation, allows laboratories to distinguish between right and left testes. The Bouin's solution should be changed within 48-72 hours, and replaced with a solution 70% Ethyl Alcohol.

D. Analytical Requirements

Laboratories require 10 grams and 5 grams of tissue for PCB residue and TAL metals analysis, respectively. If the liver of individual animals does not have sufficient weight for analysis requirements, then individual tissue will be pooled. Tissue pools will consist of the minimum number of animals needed to attain the required tissue weight. Each tissue pool will consist of a similar number of animals. Individual animals will be selected for pooling so that the sum total weight of each pooling will be as similar as possible to the other sum totals. All tissue for pooling will be from animals of similar location, species, sex and age. All excised tissue or organs not submitted for analysis will be preserved as described. Liver, liver abnormalities, one kidney, and one testis or ovary will be submitted to a subcontract laboratory for histopathological evaluation.

E. All dissection procedures should be conducted on decontaminated trays with clean instruments. All dissecting tools should be decontaminated before dissecting the next specimen, with new scalpel blades being used for each specimen. All discarded animal tissue should be disposed of with other site generated waste in accordance with EPA/REAC policy.

8.0 CALCULATIONS

All calculations will be based on the techniques of capture, duration of effort, type of analysis required, and other variables.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

9.1 Sampling Documentation

A. All muskrat specimens and samples shall be documented in accordance with SOP#2002, Sample Documentation, and chain of custody forms filled out according to SOP # , Chain of Custody. A specimen data sheet must be filled out for each specimen obtained. As described above, specimen tags must be tied through the right hind foot of all specimens, and to each pelt after skinning. Each tag should contain the site location and identification number.

B. Field Logbook

A bound field logbook must be maintained by field personnel to record daily activities, with entries made in waterproof ink. A separate entry should be made for each animal collected, with all information from the specimen label as well as pertinent observations (animal condition, weather conditions, habitat, etc.). Field activities should be photodocumented as well.

C. Sampling Design and Quality Assurance

Sampling design should be consistent with the study objectives, and should be determined with the assistance of the project statistician.

10.0 DATA VALIDATION

All chemical analyses of tissues will be verified by quality assurance review, to insure holding times, detection levels, and analytical methods described in the Quality Assurance Work Plan are adhered to. All data on field data sheets will be checked against records kept in field logbooks.

11.0 HEALTH AND SAFETY

Protective gloves should be worn while trapping, in accordance with the health and safety plan. Care should be taken in handling the traps, in order to avoid injury to the hand. Traps should not be carried while set. Traps, whether set or not, should not be thrown from one person to another, since the release pin could cause hand injuries.

During summer months, muskrats may carry external parasites such as fleas, which may transmit zoonoses. Unfortunately, insect repellant may not be used, as it may interfere with analytical results. Therefore, personnel should carefully inspect their clothing, and perhaps wear tyvek where appropriate to avoid the possibility of infection by insect bites.

During processing, a laboratory coat, rubber apron, surgical gloves, and dust/pollen mask should be worn. If an aerated laboratory hood is unavailable, then an air-purifying respirator with appropriate cartridge must be worn when mixing formaldehyde solution. The laboratory should be well ventilated when animals are processed, but doors should be kept closed during summer months to avoid flying insects.

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DATE: November 6, 1992

TO: David Charters, USEPA/ERT

FROM: Anthony LoSurdo A. LoSurdo

THRU: Vinod Kansal, S&A Section Chief Vinod Kansal

SUBJECT: Deliverables of Analytical Methods For Tissue Analysis
(WA #3347-033-01-4407-01)

Enclosed please find DRAFT copies of the following Analytical Methods:

METHOD	TITLE
T1800L	Tissue Homogenization Procedure
T1805L	Semivolatile Analysis of Tissue Samples by GC/MS
T1809L	Pesticides/PCBs Analysis of Tissue Samples by GC/ECD
T1818L	Microwave Digestion and Metal Analysis of Tissue Samples

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TISSUE HOMOGENIZATION PROCEDURE

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TISSUE HOMOGENIZATION PROCEDURE

1.0 SCOPE AND APPLICATION

This Analytical Procedure is applicable for the homogenization of fish tissues, earthworms, amphibians, small mammals, and other small biota. It can be adopted for muskrats, mink, and other larger biota.

2.0 METHOD SUMMARY

Five to 15 gram of frozen tissue is homogenized with dry ice using a variable speed laboratory blender. After homogenization is complete, the contents of the blender (tissue and dry ice) are quantitatively transferred to clean jars and the dry ice is allowed to sublime overnight in a freezer at -20°C. Homogenization of animal mass greater than 20 grams, is carried out in several steps.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING AND STORAGE

3.1 Sample Storage

- Tissue samples (or specimens) must be protected from light and kept frozen at -20°C from the time of receipt until homogenization process.
- Tissue samples and sample homogenates must be stored in an atmosphere demonstrated to be free of all potential contaminants.
- Before and after tissue sample preparation and analysis, extracts and unused tissue sample homogenate must be protected from light and kept frozen at -20°C for the periods specified by the Task Leader and/or Work Assignment Manager.
- Tissue samples and homogenates, sample extracts and standards must be stored separately.

3.2 Holding Times

Homogenization of tissue samples and extraction of homogenate shall be completed within fourteen (14) days of sampling.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

Method interferences may be caused by contaminants in solvents, reagents, glassware and sample processing hardware that lead to discrete artifacts and/or elevated baselines in the analytical method used for analysis. All of these materials must be demonstrated to be free from interferences under the conditions of homogenization and/or analysis by analyzing laboratory reagent blanks on a routine basis. Matrix interferences may also be caused by contaminants that are coextracted from the sample. The extent of matrix interferences will vary considerably from source to source.

TISSUE HOMOGENIZATION PROCEDURE

5.0 EQUIPMENT/APPARATUS

The following equipment/apparatus are required:

- Variable speed laboratory blenders
- Blending containers - stainless steel (SS) with stainless steel lids of various sizes (40, 100, 250 and 500 mL) depending on sample size
- Univex grinder
- Stainless steel and/or Teflon coated forceps, spatulas and spoons
- Stainless steel knife
- Teflon cutting board
- Stainless steel trays
- Dry ice maker (or source)
- Liquid CO_2 cylinders
- Freezer
- Analytical balance capable of accurately weighing $\pm$ 0.001 gr
- Balance capable of weighing 200 gr to the nearest 0.01 gr
- Glass collection jars with Teflon lined lids
- Coolers
- Test tube brushes

6.0 REAGENTS

- Acetone, Methanol, Methylene Chloride - pesticide residue analysis grade or equivalent
- Doubly distilled deionized water

7.0 PROCEDURES

7.1 Homogenization of fish tissues, worms, small mammals, amphibians, and other small biota with total mass of less than 15 grams.

1. Freeze tissue sample at -20°C for ca. 2 hours.
2. Weigh total sample mass to the neared 0.1 gram.

TISSUE HOMOGENIZATION PROCEDURE

3. Section tissue specimen into small pieces (0.5 to 1 inch) while frozen using a stainless steel knife. Massive bone structures such as frog skulls may also need sectioning.
4. Select appropriate blending container based on sample size. The total sample mass should be 20-25% of the volume of the blending container.
5. Pack area below blades with dry ice (NOTE: blending container should be completely dry to prevent freezing of blade assembly).
6. Transfer tissue sample to blending jar and cover with dry ice.
7. Allow tissue to freeze for 2 to 3 minutes.
8. Cover the SS blending container with SS cover and commence blending at high speeds for 1 to 2 minutes.
9. Vary the blending speed from high to intermediate at 30 sec. intervals for 3 minutes.
10. Stop blending then tap the container and lid to loosen any adhered tissue on the walls of container.
11. Open the blending container to ensure complete homogenization. If homogenization is incomplete, add a small amount of dry ice and repeat Steps 8-11 above.
12. Transfer the tissue homogenate and dry ice powder into a glass jar and cover with a Teflon lined lid.
13. Store the homogenate sample overnight at -20°C with lid loosely attached to allow sublimation of CO_2.
14. After all CO_2 has sublimed, cover the sample homogenate tightly and store in freezer at -20°C. The homogenate is ready for extraction and analysis.

7.2 Homogenization of muskrats, minks, and other larger biota with total mass greater than 50 grams.

1. Freeze tissue sample at -20°C for 4 hours.
2. Weight total sample mass.
3. Section sample laterally into 2 to 3 inch sections.
4. Pass frozen sample pieces through a Univex Grinder and collect in a stainless steel jar.
5. Store ground tissue at -20°C.
6. If necessary, homogenize the ground tissue as in Section 7.1, Steps 4-11.
7. Combine homogenized tissue into a large clean glass collection jar with Teflon-lined lid.
8. Manually mix the combined homogenate with a stainless steel spoon to ensure tissue homogeneity.
9. Store as Section 7.1, Steps 12 to 14.

SEMIVOLATILES ANALYSIS OF TISSUE SAMPLES BY GC/MS

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SEMIVOLATILES ANALYSIS OF TISSUE
SAMPLES BY GC/MS

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SEMIVOLATILES ANALYSIS OF TISSUE SAMPLES BY GC/MS

1.0 SCOPE AND APPLICATION

This Analytical Procedure applies to the determination of base, neutral, and acid (BNA) compounds in tissue matrices, using a gas chromatograph/mass spectrometer (GC/MS) method. The list of compounds of interest and their quantitation limits that are analyzed and reported by REAC can be found in Appendix A.

2.0 METHOD SUMMARY

Ten-gram aliquots of a tissue homogenate sample are dried with anhydrous sodium sulfate and Soxhelet extracted with methylene chloride solvent. The extract is clean-up by Gel Permeation Chromatography (GPC), concentrated to 1 mL, an internal standard mixture added and analyzed by GC/MS. Compounds are identified by comparing their measured mass spectra and retention times to reference spectra and retention times obtained by the measurement of calibration standards under the same conditions used for samples. Quantitation of each identified analyte is calculated by internal standard method. Appendix B lists the characteristic ions for each target compound and Appendix C lists the internal standards with corresponding target compounds assigned for quantitation.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING AND STORAGE

3.1 Sample Storage

Samples must be protected from light and kept frozen in freezer from the time of receipt until extraction and analysis.

Samples must be stored in an atmosphere demonstrated to be free of all potential contaminants.

Before and after analysis, extracts and unused samples must be protected from light and refrigerated at 4°C (± 2°C) and -20°C, respectively, for the periods specified by the Task Leader and/or Work Assignment Manager.

Samples, sample extracts, and standards must be stored separately.

3.2 Holding Times

Extraction of tissue samples shall be completed within fourteen (14) days of sampling, and analysis completed within 40 days of sample extraction.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

Method interferences may be caused by contaminants in solvents, reagents, glassware, and other sample processing hardware that lead to discrete artifacts and/or elevated baselines in the total ion current profiles. All of these materials must be demonstrated to be free from interferences under the conditions of the analysis by running laboratory reagent blanks on a routine basis. Matrix interferences may be caused by contaminants that are coextracted from the sample. The extent of matrix interferences will vary considerably from source to source.

5.0 EQUIPMENT/APPARATUS

The following equipment/apparatus is required:

- Spatula, stainless steel or Teflon
- Vials and caps, 2-mL for GC autosampler
- 250-mL Erlenmeyer Flasks
- Balance capable of weighing 100 g to the nearest 0.01g
- Analytical balance capable of accurately weighing ± 0.001 g
- Disposable pasteur pipettes (1-mL) and Pyrex glass wool prerinsed with hexane
- Test tube rack
- Desiccator
- Beakers, 250-mL
- Zymark Gel Permeation Chromatograph (GPC) system
- Zymark TurboVap II
- 50-mL test tubes
- Pateur pipets
- Filter paper, Whatman No. 541 or equivalent
- Soxhelet Extraction System
- Kuderna-Danish (K-D) apparatus consisting of 10-mL graduated concentrator tube, 500-mL evaporative flask, and three-ball macro Snyder column.
- TurboVap Concentrator Tubes
- Granular silicon carbide boiling chips - approximately 10/40 mesh. Heat to 400°C for 30 minutes or Soxhlet extract with methylene chloride.
- Water bath - heated, with concentric ring cover, capable of temperature control (±2°C). The bath should be used in a hood.
- Nitrogen evaporation device equipped with a water bath that can be maintained at 35-40°C. The N-Evap by Organomation Associations, Inc., South Berlin, MA (or equivalent) is suitable.

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- Hewlett-Packard (HP) 5995 GC/MS; equipped with a 7673 autosampler and controlled by an HP-1000 RTE-6/VM computer system.

- Restek Rtx-5 (crossbonded SE-54) column; 30 meter x 0.32 mm ID; 0.5 µm.

6.0 REAGENTS

1. Sodium Sulfate - anhydrous powdered reagent grade, heated at 400°C for four hours, cooled in a desiccator, and stored in a glass bottle.

2. Dichloromethane pesticide residue analysis grade or equivalent.

3. *Base/Neutral and Acid Surrogate Spiking Solution:*

Surrogate standards are added to all samples and calibration solutions. The compounds specified are listed below. Store the spiking solutions at 4°C (± 2°C) in Teflon-sealed containers. The solutions should be checked frequently for stability. These solutions must be replaced after twelve months, or sooner if comparison with quality control check samples indicates a problem.

Bases/Neutrals		Acids	
Nitrobenzene-d_5	100 µg/mL	phenol-d_6	200 µg/mL
2-Fluorobiphenyl	100 µg/mL	2-Fluorophenol	200 µg/mL
Terphenyl-d_{14}	100 µg/mL	2,4,6-Tribromophenol	200 µg/mL

4. Base/Neutral and Acid Matrix Spiking Solution:

Prepare a spiking solution in methanol that contains the following compounds at a concentration of 100 µg/mL for base/neutrals and 200 µg/mL for acids. Store the spiking solutions at 4°C (± 2°C) in Teflon-sealed containers. The solutions should be checked frequently for stability. These solutions must be replaced after 12 months, or sooner if comparison with quality control check samples indicates a problem.

Base/Neutrals	Acids
1,2,4-Trichlorobenzene	Pentachlorophenol
Acenaphthene	Phenol
2,4-Dinitrotoluene	2-Chlorophenol
Pyrene	4-Chloro-3-methylphenol
N-Nitroso-di-n-propylamine	4-Nitrophenol
1,4-Dichlorobenzene	

5. Internal standards - 1,4-Dichlorobenzene-d_4, Naphthalene-d_8, Acenaphthene-d_{10}, Phenanthrene-d_{10}, Chrysene-d_{12}, Perylene-d_{12}.

An internal standard solution can be prepared by dissolving 100 mg of each compound in 50 mL of methylene chloride. It may be necessary to use 5 to 10 percent benzene or toluene in this solution and a few minutes of ultrasonic mixing to dissolve all the constituents.

The resulting solution will contain each standard at a concentration of 2000 ng/μL. Store at 4°C or below when not being used. A 10 μL portion of this solution should be added to each 1 mL of sample extract. This will result in 40 ng of each internal standard in the 2 μL volume of extract injected into the GC/MS.

6. Calibration Standards:

Prepare calibration standards at a minimum of six concentration levels (5, 10, 20, 50, 80, and 120 μg/mL). Each calibration standard should contain each compound of interest and each surrogate. Nine compounds, 2,4-Dinitrophenol, 2,4,5-Trichlorophenol, 2-Nitroaniline, 3-Nitroaniline, 4-Nitroaniline, 4-Nitrophenol, 4,6-Dinitro-2-methylphenol, and Pentachlorophenol will require only a four-point initial calibration at 20, 50, 80, and 120 total ng, since detection at less than 20 ng per injection is difficult. Great care must be taken to maintain the integrity of all standard solutions. Store all standard solutions at -10°C to -20°C in screw-cap amber bottles with Teflon liners. Fresh stock standards should be prepared every six months at a minimum. The continuing calibration standard (50 ng) should be prepared weekly and stored at 4°C (± 2°C).

7. Decafluorotriphenylphosphine (DFTPP) - prepare DFTPP solution such that a 1 μL injection will contain 50 ng of DFTPP.

7.0 PROCEDURES

Tissue samples must be homogenized before pursuing following steps. See method for tissue sample homogenization.

7.1 Sample Preparation and Extraction

1. Open the homogenate sample container in a fume hood. Mix the sample thoroughly.

2. Weigh 10 ± 0.01 g aliquote of homogenized tissue sample into a 250 mL beaker, add 120 g anhydrous Na_2SO_4 and mix the tissue sample and Na_2SO_4 thoroughly with a stainless steel (SS) spatula. The sample should have a sandy texture at this point.

3. Determine the total percent solid by following the procedure outlined in Section 7.2.

4. Prepare a method blank by using 120 g Na_2SO_4 blended with 20-30 g dry ice. A method blank must be prepared every 20 samples.

5. Prepare a matrix spike (MS) and a matrix spike duplicate (MSD) by weighing two additional 10 ± 0.01 gr aliquots of homogenized tissue sample that was chosen for that purpose. Add 120 g anhydrous Na_2SO_4 to MS and MSD and mix thoroughly with SS spatula. The MS and MSD should have a sandy texture.

6. Transfer the blank, MS and MSD, and tissue samples quantitatively to precleaned soxhlet thimbles for extraction.

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7. Place thimbles into Soxhelet extractors;

   - add 1 mL of surrogate spike solution to the Method Blank, the MS and MSD, and all the samples;
   - add 1 mL of BNA matrix spike solution to each of the MS and MSD samples.

8. Add 250 mL dichloromethane (DCM) and two boiling chips to each round bottom flask extractors.

9. Connect water cooled condensor and extract for 17 to 24 hours (ca. 60-90 cycles).

10. Allow the system to cool and filter entire sample extract into a 500 mL Erlenmeyer flask through a #541 Watman filter paper with anhydrous Na_2SO_4 packed into a powder funnel. Rinse the round bottom flask with three 10 mL portions of DCM. Pass the rinsate through anhydrous Na_2SO_4 packed funnel and combine rinsate with sample extracts. The sample extract is ready for concentration.

11. Extract Concentration - The sample extract may be concentrated using one of the following methods:

    A. Kuderna-Danish (K-D) Method

       1. Assemble a Kuderna-Danish (K-D) apparatus by attaching a 10-mL concentrator tube to a 500-mL evaporative flask.

       2. Transfer the extract into a K-D concentrator flask; rinse the Erlenmeyer flask with 60 - 100 mL of methylene chloride to complete the quantitative transfer.

       3. Add one or two clean boiling chips to the evaporative flask and attach a three-ball Snyder column.

       4. Pre-wet the Snyder column by adding 2 - 3 mL of methylene chloride to the top. Place the K-D apparatus on a hot water bath (80 - 90°C) so that the concentrator tube is partially immersed in the hot water and the entire lower rounded surface of the flask is bathed with hot vapor.

       5. Concentrate the extract down to less than 10 mL. Remove the K-D apparatus and allow it to drain and cool for at least 10 minutes.

       6. Remove the Snyder column and rinse the flask and its lower joints into the concentrator tube with 1 - 2 mL of methylene chloride.

       7. Disconnect the concentrator tube and place it on N-Evap with pre-warmed water bath (35 °C). Evaporate the extract to final volume of 10 mL with a gentle stream of clean, dry nitrogen.

8. Take 1 mL for lipid determination by following procedures described in Section 7.3.

9. Transfer the remaining 9 mL extract into a 12-mL test tube. The extract is ready for GPC cleanup. If the GPC cleanup is not performed immediately, the extract should be capped, protected from light and refrigerated at 4°C (± 2°C).

B. TurboVap II Method - Set Up TurboVap II as Follows:

1. Connect the gas supply

2. Set the Nitrogen Regulator to 30 PSI (NOTE: Instrument inlet pressure MUST NOT exceed 80 PSI).

3. Fill the water bath as follows:

   a) place concentrator tubes in 5 positions
   b) pour about 1 liter deionzed (DI) water through the empty position
   c) add 15 drops of Clean Bath solution
   d) add more DI water until the water surface is as high as the initial solvent level in the sample tube
   e) DO NOT OPERATE THE INSTRUMENT WITHOUT WATER IN THE WATER BATH

4. Install the venting hose over the exhaust port, or place the instrument in the hood.

5. Turn the instrument ON.

6. Select the end point desire to one of the following positions:

   a) TIME (minutes)
   b) SENSOR
   c) SENSOR & TIME
   d) MANUAL

7. Set the WATER BATH temperature to 40°C (± 2°C) using the push wheel. (DO NOT OPERATE AT A TEMPERATURE GREATER THAN 60°C UNLESS THE SENSOR HAS BEEN REMOVED FROM THE INSTRUMENT.)

8. Set the GAS PRESSURE

   a) pull the gas regulator knob out

   b) slowly turn the regulator knob clockwise until swirling action without splashing is observed

   c) the pressure reading should be between 8 to 15 PSI

   d) push the knob in to lock in place

9. Place the sample in the instrument and press START/STOP button. When a cell raches its selected end point, the light next to its START/STOP BUTTON blinks and the beeper sounds briefly for 30 seconds.

10. Remove sample promptly and reconstitute to about 5 mL with methylene chloride.

11. Transfer the 5 mL extract into a 10 mL volumetric flask with a pasteur pipet.

12. Rinse the lower angle portion of concentrator tube with three 1 mL portions of methylene chloride by gently re-pipeting the 1 mL solvent in a circular motion and add the rinsate to the 10 mL volumentric flask and dilute to 10 mL.

13. Take 1 mL for lipid determination as described in Section 7.3.

14. Transfer the remaining 9 mL extract into a 12 mL test tube. The extract is ready for GPC cleanup. If GPC cleanup is not performed immediately, the extract should be capped, protected from light and refrigerated at 4°C (± 2°C).

7.2 Total Solids

Immediately after extracting samples, weigh 3-5 g of the homogenate tissue sample into a tared aluminum dish. Determine the total percent solid by drying in oven placed inside fume hood overnight at 105°C. Before weighing, allow samples to cool in a desiccator. Concentrations of individual analytes will be reported relative to the dry weight of the homogenate tissue sample. Calculate the total percent solid using the following equation:

$$\% \text{ Total Solid} = \frac{\text{weight of dry sample (gms)}}{\text{weight of sample before drying (gms)}} \times 100\%$$

7.3 Lipid Determination

1. Transfer 1 mL of the 10 mL extract (Section 7.1, Step A.17 or B12) into a preweighed 7.8 g (2 dram) vial and evaporate to dryness overnight.

2. Determine percent lipid gravimetrically.

3. Use remaining 9 mL extract for GPC cleanup.

7.4 Gel Permeation Chromatography (GPC) Extract Cleanup

GPC clean-up is required to separate the analytes from biological macromolecules (Lipids).

1. Transfer 5 mL extract onto the GPC column using the Zymark.

2. Collect the fraction of extract eluting just after the lipid elution and before the sulfur elution [as determined by injecting a GPC calibration mixture comprised of corn oil, bis-(2-Ethylhexyl)phthalate, methoxychlor, perylene and sulfur] in a 200 mL collecting flask.

3. Transfer the clean extract quantitatively to either a K-D or TurboVap II system and concentrate to 1 mL final extract volume.

4. Analyze the 1 mL extract using GC/MS (see Section 7.7).

7.5 GC/MS Condition

The conditions listed below are used for standards and sample analysis.

Column	Restek Rtx-5 (crossbonded SE-54) 30 meter x 0.32 mm ID, 0.50 um film thickness
Injector Temperature	290°C
Transfer Line Temperature	290°C
Source Temperature	240°C
Analyzer Temperature	240°C
Temperature Program	30°C for 3 min 15°C/min to 70°C hold for 0.2 min 8°C/min. to 295°C hold for 15 min
Splitless Injection	Split time = 60 sec
Injection Volume	2 µL

7.6 Tune (DFTPP)

The instrument must be tuned to meet the ion abundance criteria listed in Appendix D for a 50 ng (1 µl) injection of DFTPP. This criteria must be demonstrated every 12 hours during analysis.

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7.7 Initial Calibration

1. Add 20 µL of internal standard solution to each 1 mL aliquot of calibration standards.

2. Inject 1 µL each of the calibration standards after a successful DFTPP injection.

3. Calculate and tabulate the relative response factor (RRF) against the concentration for each compound, including the surrogates, by using the equation listed below. The primary ion from the specific internal standard must be used for quantitation.

   The average RRF and percent relative standard deviation (% RSD) must also be calculated and tabulated.

$$RRF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

   where:

   A_x = Area of the characteristic ion for the compound to be measured
   A_{is} = Area of the characteristic ion for the specific internal standard from Appendix B.
   C_{is} = Concentration of the internal standard (ng/µL)
   C_x = Concentration of the compound to be measured (ng/µL)

   The % RSD of the RRF for each analyte must be less than or equal to 30%. The average RRF of each compound must not be less than 0.05.

7.8 Continuing Calibration

A check of the initial calibration curve must be performed every 12 hours during analysis.

1. Inject 1 µL of a 50 µg/mL standard containing internal standards.

2. Calculate and tabulate the daily RRF for each compound. All daily RRF must be equal to or greater than 0.05.

3. Calculate the percent difference (% D) of each daily RRF compared to the average RRF from the initial calibration curve. The % D for all compounds can be calculated using the equation listed below and must be less than or equal to 25%.

$$\%\ D = \frac{|RRF_{Daily} - RRF_{Average}|}{RRF_{Average}} \times 100\%$$

4. Reanalyze initial calibration standards if any of the following compounds failed the minimum RRF (0.05) requirement: n-nitroso-di-n-propylamine, hexachlorocyclopentadiene, 2,4-dinitrophenol, and 4-nitrophenol.

5. Reanalyze initial calibration standards if any of the following compounds failed the % D requirement: phenol, 1,4-dichlorobenzene, 2-nitrophenol, 2,4-dichlorophenol, hexachlorobutadiene, 4-chloro-3-methylphenol, 2,4,6-trichlorophenol, acenaphthene, n-nitrosodiphenylamine, pentachlorophenol, fluoranthene, di-n-octylphthalate, and benzo(a)pyrene.

7.9 Sample Analysis

Sample extracts may be analyzed only after the GC/MS system has met the DFTPP, initial calibration, and continuing calibration requirements mentioned above. The same instrument conditions must be employed for the analysis of samples as were used for calibration.

1. Add 10 µL of the internal standard solution into the method blank, the MS/MSD, and all the sample extracts.

2. Inject 2 µL each of the method blank, the MS/MSD, and all the sample extracts.

3. If the analyst has reason to believe that diluting the final extracts will be necessary, an undiluted run may not be required.

4. If analytes are detected at a level greater than the highest calibration standard, sample extracts must be diluted so that the analyte response is within the linear range established during calibration.

5. If dilutions of sample extracts are made, additional internal standards must be added to maintain the required concentration (40 ng/µL) of each internal standard in the extract.

7.10 Identification of Target Compounds

Target compound identification will be conducted by comparison of the sample mass spectrum to the mass spectrum of a standard of the suspected compound. Two criteria must be satisfied to verify the identifications:

- Elution of the sample component at the GC relative retention time as the standard component
- Correspondence of the sample component and standard component mass spectra

1. For establishing correspondence of the GC relative retention time (RRT), the sample component RRT must compare within $\pm$ 0.06 RRT units of the RRT of the standard component. For reference, the standard must be run on the same shift as the sample. If coelution of interfering components prohibits accurate assignment of the sample component RRT from the total ion chromatogram, the RRT should be assigned by using extracted ion current profiles for ions unique to the component of interest.

2. For comparison of standard and sample component mass spectra, reference mass spectra must be obtained from the 50 µg/mL. These standard spectra may be obtained from the run used to obtain reference RRTs. In the case of coelution of standard spectra component, reference spectra from the National Bureau of Standards (NBS) Mass Spectral Library should be used to establish the presence of compounds of interest.

3. The requirements for qualitative verification by comparison of mass spectra are as follows:

   a. All ions present in the standard mass spectra at a relative intensity greater than 10% (most abundant ion in the spectrum equals 100%) *must* be present in the sample spectrum.

   b. The relative intensities of ions specified in (a) must agree within ± 20% between the standard and sample spectra. (For example: for an ion with an abundance of 50% in the standard spectra, the corresponding sample ion abundance must be between 30 and 70 percent.)

   c. Ions greater than 10% in the *sample* spectrum but not present in the *standard* spectrum must be considered and accounted for by the analyst making the comparison. All compounds meeting the identification criteria must be reported with their spectra. For all compounds below the quantitation limit, report the actual value followed by "J", e.g., "3J".

4. If a compound cannot be verified by all of the criteria in step 3, but in the technical judgment of the mass spectral interpretation specialist, the identification is correct, then the analyst shall report that identification and proceed with the calculation in Section 8.0. The analyst should note in the case narrative that technical judgment was utilized.

7.11 Library Search

A library search shall be executed for non-target compounds present in the method blank and the sample for the purpose of tentative identification. For this purpose, the 1985 release of the National Bureau of Standards (NBS) Mass Spectral Library (or more recent release), containing 42,261 spectra, will be used.

1. Any nonsurrogate organic compounds not listed in Appendix A for the combined base/neutral/acid fraction shall be tentatively identified via a forward search of the NBS mass spectral library. (Substances with responses less than 10% of the nearest internal standard are not required to be searched in this fashion.) Only after visual comparison of sample spectra with the nearest library searches will the mass spectral interpretation specialist assign a tentative identification. Analyst should be careful not to report a volatile (VOA) target compound in such practice if the VOA analysis is also requested.

NOTE: Computer generated library search routines must not use normalization routines that would misrepresent the library or unknown spectra when compared to each other.

2. Guidelines for making tentative identification:

   - Relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum.
   - The relative intensities of the major ions should agree within ± 20%. (For example: for an ion with an abundance of 50% in the standard spectra, the corresponding sample ion abundance must be between 30 and 70 percent.)
   - Molecular ions present in reference spectrum should be present in sample spectrum.
   - Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of co-eluting compounds.
   - Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or coeluting compounds.

   NOTE: Data system library reduction programs can sometimes create these discrepancies.

3. If in the technical judgment of the mass spectral interpretation specialist, no valid tentative identification can be made, the compound should be reported as *unknown*. The mass spectral specialist should give additional classification of the unknown compound, if possible (i.e., unknown phthalate, unknown hydrocarbon, unknown acid type, unknown chlorinated compound). If probable molecular weights can be distinguished, include them.

8.0 CALCULATIONS

8.1 Target Compound

Identified target compounds must be quantitated by the internal standard method. The internal standard used must be the one nearest the retention time to that of a given analyte (see Appendix C). The extracted ion current profile (EICP) area of characteristic ions of analytes listed in Appendix B is used for quantitation.

Calculate the concentration in the sample using the daily relative response factor (RRF) obtained from the continuing calibration standard as determined in Section 7.7 and the equation listed below. If samples are analyzed under the initial calibration curve, the average RRF must be used.

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$$\text{Concentration } (\mu g/kg) = \frac{(A_x)(I_s)(V_t)(DF)}{(A_{is})(RRF)(W)(V_i)(S)}$$

where:

A_x = Area of the characteristic ion for the compound to be measured
A_{is} = Area of the characteristic ion for the internal standard
I_s = Amount of internal standard injected (ng)
W = Weight of soil/sediment extracted (kg)
V_i = Volume of extract injected (µL)
V_t = Volume of the concentrated extract (mL)
DF = Dilution Factor
S = Decimal percent solid

When the target compound concentrations are below the quantitation limits but the spectrum meets the identification criteria, report the concentration as estimated by flagging the results with a "J".

8.2 Tentatively Identified Compounds (TICs)

An estimated concentration for tentatively identified compounds (TICs) must be calculated by the internal standard method. The nearest internal standard free of interferences must be used. The equation for calculating concentration is the same as in Section 8.1. Total area counts or peak heights from the total ion chromatograms are to be used for both the compound to be measured and the internal standard. An RRF of one (1) is to be assumed.

8.3 Surrogate Spike Recoveries

Calculate surrogate standard recovery on all samples, blanks, and spikes by using the equation listed below.

$$\text{Percent Recovery (\%R)} = \frac{Q_d}{Q_a} \times 100\%$$

where:

Q_d = Quantity determined by analysis
Q_a = Quantity added to sample

8.4 Matrix Spike Recoveries

The percent recoveries and the relative percent difference (RPD) between the recoveries of each of the 11 compounds in the matrix spike samples will be calculated and reported by using the following equations:

$$\text{Matrix Spike Recovery (\%)} = \frac{SSR - SR}{SA} \times 100\%$$

where:

SSR = Spike sample result
SR = Sample result
SA = Spike added

$$RPD = \frac{|MSR - MSDR|}{(MSR + MSDR)/2} \times 100\%$$

where:

RPD = Relative percent difference
MSR = Matrix spike recovery
MSDR = Matrix spike duplicate recovery

The vertical bars in the formula above indicate the absolute value of the difference; hence RPD is always expressed as a positive value.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

9.1 Tune (DFTPP)

Prior to initiating any data collection activities involving samples, blanks, or standards, it is necessary to establish that a given GC/MS system meets the instrument tune criteria specified in Appendix D. The purpose of this instrument check is to assure correct mass calibration, mass resolution, and mass transmission. This is accomplished through the analysis of DFTPP.

1. The analysis of DFTPP must be performed every 12 hours during the analysis.

2. The key ions produced during the analysis of DFTPP and their respective ion abundance criteria are given in Appendix D.

9.2 Initial Calibration for Target Compounds and Surrogates

Prior to the analysis of samples and required blanks, and after instrument performance criteria have been met, the GC/MS system must be initially calibrated at a minimum of five concentrations to determine the linearity of response utilizing target compound and surrogate standards.

1. The levels of the initial calibration standards for semivolatile target compounds and surrogates are 5, 10, 20, 50, 80, and 120 µg/mL. Nine compounds: 2,4-dinitrophenol, 2,4,5-trichlorobenzene, 2-nitroaniline, 3-nitroaniline, 4-nitroaniline, 4-nitrophenol, 4,6-dinitro-2-methylphenol, and pentachlorophenol will only require a four-point initial calibration at 20, 50, 80, and 120 µg/mL since detection at less than 20 µg/mL is difficult.

2. The calibration of the GC/MS is evaluated on the basis of the magnitude and stability of the relative response factors of each target compound and surrogate. The minimum RRF of each compound at each concentration level in the initial calibration across all five points must be equal to or greater than 0.05; the % RSD must not exceed 30%.

9.3 Continuing Calibration for Target Compounds and Surrogates

Once the GC/MS system has been calibrated, the calibration must be verified each 12-hour time period for each GC/MS system during the analysis.

1. The level of the continuing calibration standard for target compounds and surrogates is 50 µg/mL.

2. The standard is to be analyzed every 12 hours after an acceptable DFTPP analysis.

3. The continuing calibration of the GC/MS system is evaluated on the basis of the magnitude of the relative response factors and the percent difference between the *average* RRF of each compound from the initial calibration and the RRF of that compound in the continuing calibration standard. The minimum RRF of each compound in the continuing calibration must be greater than or equal to 0.05. The % D must not exceed 25%.

4. If any of the requirements listed in Item 3 are not met, a new initial calibration must be analyzed.

9.4 Internal Standard Responses and Retention Times

The response of each of the internal standards in all calibration standards, samples, and blanks is crucial to the provision of reliable analytical results because the quantitative determination of semivolatile compounds by these procedures is based on the use of internal standards added immediately prior to analysis.

1. The specific compounds used as internal standards are given in Section 6.0, paragraph 5. The amount of each internal standard in the injection volume (2 µL) of the sample extract analyzed by GC/MS must be 40 ng (40µg/mL).

2. The area response of each internal standard from the EICP and the retention time of the internal standard are evaluated for stability. The area of the internal standard in a sample must not vary by more than a factor of 2 (i.e., -50% to +100%) from the area of the same internal standard in the associated continuing calibration standard. Likewise, the retention time of an internal standard must be within ± 0.50 minutes (30 seconds) of its retention time in the continuing calibration standard.

3. If samples are analyzed under the initial calibration, the area of the 50 µg/mL standard must be used for monitoring.

4. The area response of each internal standard in all samples, blanks and spikes must be tabulated. If it is outside the QC limits, no action needs to be taken at this point. However, all internal standards must be present to avoid the reanalysis.

9.5 Method Blank Analysis

A method blank is a weight of a clean reference matrix (pure anhydrous Na_2SO_4) that is carried through the entire analytical procedure. The weight of the reference matrix must be approximately equal to the weight of samples associated with the blank. The purpose of a method blank is to determine the levels of contamination associated with the processing and analysis of samples.

1. The method blank must be prepared for each batch not exceeding 20 samples.

2. A method blank must contain less than or equal to five times (5x) the QL of the phthalate esters listed in Appendix A. For all other target compounds, the method blank must contain less than or equal to the QL of any single target compound.

3. If a method blank exceeds the limits for contamination above, the analyst must consider the analytical system out of control. The source of the contamination must be investigated and appropriate corrective actions taken and documented before further sample analysis proceeds. All samples processed with a contaminated method blank must be re-extracted and reanalyzed.

9.6 Surrogate Recoveries

The recoveries of the six surrogates are calculated from the analysis of each sample, blank, matrix spike and matrix spike duplicate. The purpose of the surrogates is to evaluate the preparation and analysis of samples.

1. The surrogates are added to each sample, blank, matrix spike, and matrix spike duplicate prior to extraction, at the concentrations described in Sections 6.0 and 7.1.

2. The recoveries of the surrogates are calculated according to the equation in Section 8.3.

3. The recoveries must be within the quality control limits given below.

Compound	% Recovery
Nitrobenzene-d_5	23 - 120
2-Fluorobiphenyl	30 - 115
Terphenyl-d_{14}	18 - 137
Phenol-d_6	24 - 113
2-Fluorophenol	25 - 121
2,4,6-Tribromophenol	19 - 122

4. If two base/neutral or two acid surrogates are out of QC limits *OR* if recovery of any *one* base/neutral or acid surrogate is below 10%, the following actions are required:

   a. Check to be sure that there are no errors in calculations, surrogate solutions, and internal standards. Also check that the quantitation ions of internal standards and surrogates are properly integrated.

   b. Reanalyze the sample if none of the above reveal a problem. If a blank does not meet the specification, it may be reanalyzed alone.

   c. Do not reanalyze dilutions if surrogate recoveries are outside the limits.

   d. If the sample associate with the matrix spike and matrix spike duplicate does *not* meet specifications, it should be reanalyzed only if the MS/MSD surrogate recoveries are within the limits. If the sample and associated MS/MSD show the same pattern (i.e., outside the limits), then the sample does *not* require reanalysis and a reanalysis must not be submitted. Document in the narrative the similarity in surrogate recoveries.

5. If the reanalysis of the sample solves the problem, then the problem was within the laboratory's control. Therefore, submit *only* data from the analysis with surrogate spike recoveries *within* the QC limits. This shall be considered the *initial* analysis and shall be reported as such on all data deliverables. If the reanalysis is outside the analysis holding time, provide the data from both analyses.

6. If none of the steps mentioned above solves the problem, then, except as noted below, *re-extract* and *reanalyze* the sample. If the re-extraction and reanalysis of the sample solves the problem, submit *only* data from the analysis with surrogate recoveries *within* the QC limits. This shall be considered the *initial* analysis and shall be reported as such on all data deliverables. If the re-extraction is outside the holding time, provide the data from both analyses.

   a. If surrogate recoveries in a blank do not meet specifications even after reanalysis, *all* of the samples associated with that blank must be re-extracted along with the blank. The blank is intended to detect contamination in samples processed *at the same time*.

   b. Do not re-extract diluted samples if surrogate recoveries are outside the limits.

   c. Never re-extract the MS/MSD, even if surrogate recoveries are outside the limits.

   d. If the sample associated with the MS/MSD does not meet specifications after reanalysis, it should be re-extracted only if the reanalysis surrogate recoveries

are not within the limits and MS/MSD surrogate recoveries are within the limits. If the sample and associated MS/MSD show the same pattern (i.e., outside the limits), then the sample does not require reanalysis and a reanalysis must not be submitted. Document in the narrative the similarity in surrogate recoveries.

7. If the re-extraction and reanalysis of the sample does not solve the problem (i.e., the surrogate recoveries are outside the QC limits for both analyses), then submit the surrogate recovery data and sample analysis data from the initial analysis of *both* sample extracts (e.g., the first analysis of both extracts of the sample). Distinguish between the initial analysis and the analysis of the re-extracted sample on all data deliverables.

9.7 Matrix Spike and Matrix Spike Duplicate Analysis

The purpose of spiking target compounds into two aliquots of a sample is to evaluate the effects of the sample matrix on the methods used.

1. The MS/MSD must be prepared every 10 samples per matrix within each project.

2. The mixture of the spike solution specified in Section 6.0 must be used to result in the concentration specified.

3. The recoveries of the matrix spike compounds are calculated according to the equation in Section 8.4, The relative percent difference between the results for each spiked analyte of the matrix spike and the matrix spike duplicate is calculated according to the equation in Section 8.4.

4. The quality control limits for recovery and relative percent difference are given below. These limits are only advisory at this time, and no further action is required when the limits are exceeded.

Compound	% Recovery	RPD
Phenol	26 - 90	35
2-Chlorophenol	25 - 102	50
1,4-Dichlorobenzene	28 - 104	27
N-Nitroso-di-n-propylamine	41 - 126	38
1,2,4-Trichlorobenzene	38 - 107	23
4-Chloro-3-methylphenol	26 - 103	33
Acenaphthene	31 - 137	19
4-Nitrophenol	11 - 114	50
2,4-Dinitrotoluene	28 - 89	47
Pentachlorophenol	17 - 109	47
Pyrene	35 - 142	36

9.8 Dilution Analysis

If the concentration of any sample extract exceeds the initial calibration range, that sample extract must be diluted and reanalyzed as described in Section 7.9, steps 4 and 5.

1. Use the results of the original analysis to determine the approximate dilution factor required to get the largest analyte peak within the initial calibration range.

2. The dilution factor chosen should keep the response of the largest analyte peak for a *target compound* in the upper half of the initial calibration range of the instrument.

3. Do *not* submit data for more than two analyses, i.e., the original sample and *one* dilution, or, if the semivolatile screening procedure was employed, from the most concentrated dilution analyzed and one further dilution.

10.0 DATA VALIDATION

Data validation will be performed by the Analytical Project Control Group and therefore it is not applicable to this method. However, data is considered satisfactory for submission purposes when *ALL* the requirements mentioned below are met.

1. All samples must be analyzed under an acceptable tune, initial calibration, and continuing calibration check at the required frequency.

2. All the QC requirements described in Section 9.0 must be met at all times.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, refer to U.S. EPA, OSHA and corporate health and safety practices. More specifically, refer to ERT/REAC SOP #3013, REAC Laboratory Safety Program.

12.0 REFERENCES

Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Third Edition, SW-846, September 1986.

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U.S. EPA Bioaccumulation Monitoring Guidance: Analytical Methods for USEPA Priority Pollutants and 301(h) Pesticides in Tissues from Estuarine and Marine Organisms (May, 1988). Prepared by Tetra Tech, Inc.

APPENDIX A
Target Compound List and Quantitation Limits
Method T1805L
October 1992

SEMIVOLATILES ANALYSIS OF TISSUE SAMPLES BY GC/MS

Target Compound List and Quantitation Limits[1]

COMPOUND	QL[2] (mg/kg)
Phenol	1.0
bis(2-Chloroethyl)ether	1.0
2-Chlorophenol	1.0
1,3-Dichlorobenzene	1.0
1,4-Dichlorobenzene	1.0
Benzyl alcohol	1.0
1,2-Dichlorobenzene	1.0
2-Methylphenol	1.0
bis(2-Chloroisopropyl)ether	1.0
4-Methylphenol	1.0
N-Nitroso-Di-n-propylamine	1.0
Hexachloroethane	1.0
Nitrobenzene	1.0
Isophorone	1.0
2-Nitrophenol	1.0
2,4-Dimethylphenol	1.0
bis(2-Chloroethoxy)methane	1.0
2,4-Dichlorophenol	1.0
1,2,4-Trichlorobenzene	1.0
Naphthalene	1.0
4-Chloroaniline	1.0
Hexachlorobutadiene	1.0
4-Chloro-3-methylphenol	1.0
2-Methylnaphthalene	1.0
Hexachlorocyclopentadiene	1.0
2,4,6-Trichlorophenol	1.0
2,4,5-Trichlorophenol	2.0
2-Chloronaphthalene	1.0
2-Nitroanaline	2.0
Dimethylphthalate	1.0
Acenaphthylene	1.0
3-Nitroanaline	2.0
Acenaphthene	1.0
2,4-Dinitrophenol	2.0

(1) On a wet-weight basis
(2) QL denotes Quantitation Limits

SEMIVOLATILES ANALYSIS OF TISSUE
SAMPLES BY GC/MS

Target Compound List and Quantitation Limits[1] (cont'd)

COMPOUND	QL[2] (mg/kg)
4-Nitrophenol	2.0
Dibenzofuran	1.0
2,6-Dinitrotoluene	1.0
2,4-Dinitrotoluene	1.0
Diethylphthalate	1.0
4-Chlorophenyl-phenylether	1.0
Fluorene	1.0
4-Nitroanaline	2.0
4,6-Dinitro-2-methylphenol	2.0
N-Nitrosodiphenylamine	1.0
4-Bromophenyl-phenylether	1.0
Hexachlorobenzene	1.0
Pentachlorophenol	2.0
Phenanthrene	1.0
Anthracene	1.0
Carbazole	1.0
Di-n-butylphthalate	1.0
Fluoranthene	1.0
Pyrene	1.0
Butylbenzylphthalate	1.0
3,3'-Dichlorobenzidine	13.5
Benzo(a)anthracene	1.0
Bis(2-Ethylhexyl)phthalate	1.0
Chrysene	1.0
Di-n-octylphthalate	1.0
Benzo(b)fluoranthene	1.0
Benzo(k)fluoranthene	1.0
Benzo(a)pyrene	1.0
Indeno(1,2,3-cd)pyrene	1.0
Dibenzo(a,h)anthracene	1.0
Benzo(g,h,i)perylene	1.0

(1) On a wet-weight basis
(2) QL denotes Quantitation Limits

APPENDIX B
Characteristic Ions for Target Compounds and Surrogates
Method T1805L
October 1992

SEMIVOLATILES ANALYSIS OF TISSUE
SAMPLES BY GC/MS

Characteristic Ions for Target Compounds and Surrogates

Parameter	Primary Ion	Secondary Ion(s)
1,4-Dichlorobenzene-d_4 (ISTD)[1]	152	115
Phenol	94	65, 66
bis(2-Chloroethyl)ether	93	63, 95
2-Chlorophenol	128	64, 130
1,3-Dichlorobenzene	146	148, 113
1,4-Dichlorobenzene	146	148, 113
1,2-Dichlorobenzene	146	148, 113
2-Methylphenol	108	107
Benzyl alcohol	79	77, 108
bis(2-Chloroisopropyl)ether	45	39, 121
4-Methylphenol	108	107
N-Nitroso-di-n-propylamine	70	42, 101, 130
Hexachloroethane	117	201, 199
Naphthalene-d_8 (ISTD)	136	68
Nitrobenzene	77	123, 65
Isophorone	82	95, 138
2-Nitrophenol	139	65, 109
2,4-Dimethylphenol	107	121, 122
bis(2-Chloroethoxy)methane	93	95, 123
2,4-Dichlorophenol	162	164, 98
1,2,4-Trichlorobenzene	180	182, 145
Naphthalene	128	129, 127
4-Chloroaniline	127	129
Hexachlorobutadiene	225	223, 227
4-Chloro-3-methylphenol	107	144, 142
2-Methylnaphthalene	142	141
Acenaphthene-d_{10} (ISTD)	164	160, 162
Hexachlorocyclopentadiene	237	235, 272
2,4,6-Trichlorophenol	196	198, 200
2,4,5-Trichlorophenol	196	198, 200
2-Chloronaphthalene	162	164, 127
2-Nitroanaline	65	92, 138
Dimethylphthalate	163	194, 164
Acenaphthylene	152	151, 153
3-Nitroanaline	138	108, 92
Acenaphthene	153	152, 154
2,4-Dinitrophenol	184	63, 154

[1] ISTD denotes Internal Standard

SEMIVOLATILES ANALYSIS OF TISSUE
SAMPLES BY GC/MS

Characteristic Ions for Target Compounds and Surrogates
(continued)

Parameter	Primary Ion	Secondary Ion(s)
4-Nitrophenol	109	139, 65
Dibenzofuran	168	139
2,4-Dinitrotoluene	165	63, 182
2,6-Dinitrotoluene	165	89, 121
Diethylphthalate	149	177, 150
4-Chlorophenyl-phenylether	204	206, 141
Fluorene	166	165, 167
4-Nitroanaline	138	92, 108
Phenanthrene-d_{10} (ISTD)	188	94, 80
4,6-Dinitro-2-methylphenol	198	182, 77
N-Nitrosodiphenylamine	169	168, 167
4-Bromophenyl-phenylether	248	250, 141
Hexachlorobenzene	284	142, 249
Pentachlorophenol	266	264, 268
Phenanthrene	178	179, 176
Anthracene	178	179, 176
Carbazole	167	166, 139
Di-n-butylphthalate	149	150, 104
Fluoranthene	202	101, 100
Chrysene-d_{12} (ISTD)	240	120, 236
Pyrene	202	101, 100
Butylbenzylphthalate	149	91, 206
3,3'-Dichlorobenzidine	252	254, 126
Benzo(a)anthracene	228	229, 226
Bis(2-Ethylhexyl)phthalate	149	167, 279
Chrysene	228	226, 229
Perylene-d_{12} (ISTD)	264	260, 265
Di-n-octylphthalate	149	—
Benzo(b)fluoranthene	252	253, 125
Benzo(k)fluoranthene	252	253, 125
Benzo(a)pyrene	252	253, 125
Indeno(1,2,3-cd)pyrene	276	138, 227
Dibenzo(a,h)anthracene	278	139, 279
Benzo(g,h,i)perylene	276	138, 277

SEMIVOLATILES ANALYSIS OF TISSUE
SAMPLES BY GC/MS

Characteristic Ions for Target Compounds and Surrogates
(continued)

Parameter	Primary Ion	Secondary Ion(s)
SURROGATES		
Phenol-d_6	99	42, 71
2-Fluorophenol	112	64
2,4,6-Tribromophenol	330	332, 141
Nitrobenzene-d_5	82	128, 54
2-Fluorobiphenyl	172	171
Terphenyl-d_{14}	244	122, 212

APPENDIX C
Internal Standards with Corresponding Target Compounds and Surrogates Assigned for Quantitation
Method T1805L
October 1992

Internal Standards with Corresponding Target Compounds and Surrogates Assigned for Quantitation

1,4-Dichorobenzene-d_4	Naphthalene-d_8	Acenaphthene-d_{10}	Phenanthrene-d_{10}	Chrysene-d_{12}	Perylene-d_{12}
Phenol	Nitrobenzene	Hexachlorocyclo-pentadiene	4,6-Dinitro-2-methylphenol	Butylbenzylphthalate	Di-n-octylphthalate
bis(2-Chloroethyl) ether	Isophorone	2,4,6-Trichlorophenol	N-nitrosodiphenylamine	3,3'-Dichlorobenzidine	Benzo(b)fluoranthene
2-Chlorophenol	2-Nitrophenol	2,4,5-Trichlorophenol	4-Bromophenyl phenyl ether	Benzo(a)anthracene	Benzo(k)fluoranthene
1,3-Dichlorobenzene	2,4-Dimethylphenol	2-Chloronaphthalene	Hexachlorobenzene	bis(2-Ethylhexyl) phthalate	Benzo(a)pyrene
1,4-Dichlorobenzene	bis(2-Chloroethoxy) methane	2-Nitroaniline	Pentachlorophenol	Chrysene	Indeno(1,2,3-cd) pyrene
1,2-Dichlorobenzene	2,4-Dichlorophenol	Dimethyl Phthalate	Phenanthrene	Terphenyl-d_{14} (surr)	Dibenz(a,h)anthracene
2-Methylphenol	1,2,4-Trichlorobenzene	Acenaphthylene	Carbazole		Benzo(g,h,i)perylene
Benzyl alcohol	Naphthalene	3-Nitroaniline	Anthracene		
bis(2-Chloro-isopropyl)ether	4-Chloroaniline	Acenaphthene	Di-n-butylphthalate		
4-Methylphenol	Hexachlorobutadiene	2,4-Dinitrophenol	Fluoranthene		
N-Nitroso-Di-n-propylamine	4-Chloro-3-methylphenol	4-Nitrophenol	Pyrene		
Hexachloroethane	2-Methylnaphthalene	Dibenzofuran			
2-Fluorophenol (surr)	Nitobenzene-d_5 (surr)	2,4-Dinitrotoluene			
Phenol-d_6 (surr)		2,6-Dinitrotoluene			
		Diethyl phthalate			
		4-Chlorophenyl phenyl ether			
		Fluorene			
		4-Nitroaniline			
		2-Fluorobiphenyl (surr)			
		2,4,6-Tribromophenol (surr)			

surr = surrogate compound

APPENDIX D
Ion Abundance Criteria for Tune (DFTPP)
Method T1805L
October 1992

SEMIVOLATILES ANALYSIS OF TISSUE
SAMPLES BY GC/MS

Ion Abundance Criteria for Tune (DFTPP)

Mass	Ion Abundance Criteria
51	30.0 - 80.0 percent of mass 198
68	Less than 2.0 percent of mass 69
69	Present
70	Less than 2.0 percent of mass 69
127	25.0 - 75.0 percent of mass 198
197	Less than 1.0 percent of mass 198
198	Base peak, 100 percent relative abundance (see note)
199	5.0 - 9.0 percent of mass 198
275	10.0 - 30.0 percent of mass 198
365	Greater than 0.75 percent of mass 198
441	Present but less than mass 443
442	40.0 - 110.0 percent of mass 198
443	15.0 - 24.0 percent of mass 442

NOTE: All ion abundances MUST be normalized to m/z 198, the nominal base peak, even though the ion abundances of m/z 442 may be up to 110 percent that of m/z 198.

MICROWAVE DIGESTION AND METAL ANALYSIS OF TISSUE SAMPLES

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MICROWAVE DIGESTION AND METAL ANALYSIS OF TISSUE SAMPLES

1.0 INTRODUCTION

Microwave digestion is the proposed preparation method to be used in place of hot plate digestion for metal analysis in tissue samples.

2.0 PROCEDURE

Tissue samples must be homogenized before pursuing the ensuing steps. Then the tissue homogenate samples are prepared as follows:

- Weigh 0.5 $\pm$ 0.001 gram tissue homogenate sample into a pre-cleaned microwave Teflon digestion vessel and add 5 mL concentrated nitric acid (HNO_3).
- Transfer the digestion vessel onto a hot plate and slowly evaporate the HNO_3 until nearly dry at 60°C.
- Remove the digestion vessel from the hot plate, let it cool to room temperature and add an additional 5 mL of concentrated HNO_3.
- Seal the digestion vessel with Teflon cap and place it on the carousel in the microwave oven. The carousel can hold up to 12 Teflon digestion vessels (samples).
- The microwave digestion is carried out in three stages as follows:

STAGE	% POWER	TIME (min)
1	100	1.5
2	50	3.5
3	35	6.5

- When the third stage is completed, remove the digestion vessels from the microwave oven and let them cool to room temperature.

- Then quantitatively transfer the contents of the digestion vessel into 50 mL or 100 mL volumetric flasks and dilute to mark (50 mL or 100 mL) with deionized water. (NOTE: If necessary, suspended particles should be removed by passing the sample solution through a fine filter paper).

- The sample is now ready for metal analysis by atomic absorption (AA) spectroscopy.

3.0 ANALYSIS

The analytical procedure for metal analysis are described in SOP #1818 ("Determination of Metals by Atomic Absorption (AA(Methods").

ldm/losurdo/t1818l

PESTICIDES/PCBS ANALYSIS OF
TISSUE SAMPLES BY GC/ECD

DRAFT

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DRAFT

PESTICIDES/PCBS ANALYSIS OF TISSUE SAMPLES BY GC/ECD

1.0 SCOPE AND APPLICATION

This Analytical Procedure is applicable to the determination of organochlorinated pesticides and polychlorinated biphenyls (PCBs) in tissue matrices, using a gas chromatograph (GC) electron capture detector (ECD) method. The compounds of interest can be found in Appendix A.

2.0 METHOD SUMMARY

Ten-gram aliquots of a tissue homogenate sample are dried with anhydrous sodium sulfate and Soxhelet extracted with methylene chloride solvent. The methylene chloride extract is cleanup by Gel Permeation Chromatography (GPC); solvent exchanged to hexane and then concentrated to 1-mL final extract volume. The extracts are analyzed using GC/ECD. A second column is always used for confirmation whether pesticide/PCBs are tentatively identified or not.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

3.1 Sample Storage

Samples must be protected from light and kept frozen in a freezer from the time of receipt until extraction and analysis.

Samples must be stored in an atmosphere free of all potential contaminants.

Before and after analysis, extracts and unused samples must be protected from light and refrigerated at 4°C (±2°C) and -20°C, respsectively, for the periods specified by the Task Leader and/or Work Assignment Manager.

Samples, sample extracts, and standards must be stored separately.

3.2 Holding Times

Extraction of tissue homogenate samples should be completed within fourteen (14) days of sampling.

Extracts of tissue homogenate samples must be analyzed within 40 days of sample extraction.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

Solvents, reagents, glassware, and other sample processing hardware may yield artifacts and/or interferences to sample analysis. All these materials must be free from interferences under the conditions of the analysis by analyzing method blanks. Specific selection of reagents and purification of solvents by distillation in all-glass systems may be required.

Interferences coextracted from the samples will vary considerably from source to source. If analysis of an extracted sample is prevented due to interferences, further cleanup of the sample extract may be necessary.

Phthalate esters contaminate many types of products commonly found in the laboratory. Plastics, in particular, must be avoided because phthalates are commonly used as plasticizers and are easily extracted from plastic materials. Serious phthalate contamination may result at any time if consistent quality control is not practiced.

Soap residue on glassware may cause degradation of certain analytes. Specifically, aldrin, heptachlor, and most organophosphorous pesticides will degrade in this situation. This problem is especially pronounced with glassware that may be difficult to rinse. These items should be hand-rinsed very carefully to avoid this problem.

5.0 EQUIPMENT/APPARATUS

The following equipment/apparatus is required:

- Spatula, stainless steel or Teflon
- Balance capable of weighing 100 g to the nearest 0.01 g
- Vials and caps, 2-mL for GC autosampler
- 250-mL Erlenmeyer Flasks
- Balance - analytical, capable of accurately weighing $\pm$ 0.0001 g
- Disposable pasteur pipettes (1-mL) and Pyrex glass wool prerinsed with hexane
- Test tube rack
- Drying oven
- Dessicator
- Beakers, 250-mL
- 50-mL test tubes
- Filter paper, Whatman No. 541 or equivalent
- Soxhelet Extractor System
- Kuderna-Danish (K-D) apparatus consisting of a 10-mL graduated concentrator tube, 500-mL evaporative flask, and three-ball macro Snyder column.
- Zymark Gel Permeation Chromatography (GPC) System

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- Zymark TurboVap II System
- TurboVap concentrator tubs
- Pasteur pipets
- Granular silicon carbide boiling chips - approximately 10/40 mesh. Heat to 400°C for 30 minutes or Soxhlet extract with methylene chloride.
- Water bath - heated, with concentric ring cover, capable of being temperature controlled (±2°C). The bath should be used in a hood.
- Nitrogen evaporation device equipped with a water bath that can be maintained at 35-40°C. The N-Evap by Organomation Associations, Inc., South Berlin, MA (or equivalent) is suitable.
- Chromatography column for florisil; 300 mm long and 11 mm ID glass column plugged with a small piece of Pyrex glass wool in the tip. Pyrex glass wool must be prerinsed with methylene chloride to ensure its cleanliness.
- Gas chromatograph - An analytical system complete with gas chromatograph and all required accessories including syringes, analytical columns, gases, an electron capture detector, and strip-chart recorder with recording integrator. A data system is required for measuring peak areas or peak heights and recording retention times. Analytical columns are:

  RTx - 1701 column - 30 m x 0.53 mm ID - 0.5 um film thickness or equivalent.

  DB-608 column - 30 m x 0.53 mm ID - 0.83 um film thickness or equivalent.

6.0 REAGENTS

1. Sodium Sulfate - anhydrous granular reagent grade, heated at 400°C for four hours, cooled in a dessicator, and stored in a glass bottle.
2. Methylene chloride (pesticide residue analysis grade or equivalent)
3. Hexane (pesticide residue analysis grade or equivalent)
4. Methanol (pesticide residue analysis grade or equivalent)
5. Acetone (pesticide residue analysis grade or equivalent)
6. Ethyl ether (pesticide residue analysis grade or equivalent)
7. 2-Propanol (pesticide residue analysis grade or equivalent)

8. Florisil (pesticide residue grade; 60/100 mesh)

9. Tetrabutylammonium (TBA) - sulfite reagent:

Dissolve 3.39 g tetrabutylammonium hydrogen sulfate in 100 mL reagent water. To remove impurities, extract this solution three times with 20-mL portions of hexane. Discard the hexane extracts, and add 25 g sodium sulfite to the water solution. Store the resulting solution, which is saturated with sodium sulfite, in an amber bottle with a Teflon-lined screw-cap. This solution can be stored at room temperature for at least one month.

10. Stock Standard Solution:

All compounds of interest must be prepared in acetone and stored in Teflon-sealed containers at 4°C. The solution should be checked frequently for stability. These solutions must be replaced after six months, or sooner if comparison with quality control check sample indicates a problem.

11. Pesticide/PCB Surrogate Spiking Solution:

The compounds specified are decachlorobiphenyl (DCBP) and 2,4,5,6-tetrachloro-meta-xylene (TCMX). Prepare a solution at a concentration of 2 ug/mL in acetone. Store the spiking solutions at 4°C (±2°C) in Teflon-sealed containers. The solutions should be checked monthly for stability. These solutions must be replaced after six months, or sooner if comparison with quality control check samples indicates that the concentration has changed.

12. Pesticide/PCB Matrix Spiking Solution:

Prepare a spiking solution in acetone that contains the pesticides in the concentrations specified below. For PCB only analysis, prepare Aroclor 1260 (Ar 1260) spike solution in iso-octane at a concentration of 10 ug/mL. Store the spiking solutions at 4°C (±2°C) in Teflon-sealed containers. The solutions should be checked monthly for stability. These solutions must be replaced after six months, or sooner, if comparison with quality control check indicates that the concentration of the standard has changed.

Pesticide	ug/mL
gamma-BHC	2.0
Heptachlor	2.0
Aldrin	2.0
Dieldrin	2.0
Endrin	2.0
4,4'-DDT	2.0

13. Pesticide Calibration Standard Solution:

Prepare pesticide calibration standards containing surrogate compounds at a minimum of five concentration levels: 20 ppb, 50 ppb, 100 ppb, 200 ppb, and 500 ppb, for each parameter of interest by adding volumes of one or more stock standards to a volumetric flask and diluting to volume with hexane. Each standard mixture must contain all compounds listed in Appendix A.

14. Toxaphene and PCB Calibration Standards:

Prepare toxaphene standards at the following concentrations: 100 ppb, 250 ppb, 500 ppb, 1 ppm, and 2 ppm. Prepare PCB calibration standards at a minimum of five concentration levels, 100 ppb, 250 ppb, 500 ppb, 1 ppm, and 2 ppm. The Ar 1221 standards should be at 200 ppb, 500 ppb, 1 ppm, 2 ppm, and 5 ppm. All the toxaphene and PCB standards must also contain surrogate compounds at a concentration of 100 ppb.

15. Resolution Check Mixture

Prepare the mixture of pesticides in hexane or iso-octane at the concentrations listed below. The mixture must be prepared every six months, or sooner if the solution has degraded or concentrated.

• gamma-Chlordane	20 ng/mL
• Endosulfan I	20 ng/mL
• p,p'-DDE	40 ng/mL
• Dieldrin	40 ng/mL
• Endosulfan sulfate	40 ng/mL
• Endrin ketone	40 ng/mL
• Methoxychlor	200 ng/mL
• Tetrachloro-m-xylene	40 ng/mL
• Decachlorobiphenyl	40 ng/mL

16. Performance Evaluation Mixture (PEM)

Prepare the PEM in hexane or iso-octane at the concentration levels listed below. The PEM must be prepared weekly, or more often if the solution has degraded or concentrated.

• gamma-BHC	20 ng/mL
• alpha-BHC	20 ng/mL
• 4,4'-DDT	200 ng/mL
• beta-BHC	20 ng/mL
• Endrin	100 ng/mL
• Methoxychlor	500 ng/mL
• Tetrachloro-m-xylene	40 ng/mL
• Decachlorobiphenyl	40 ng/mL

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7.0 PROCEDURE

Tissue samples must be homogenized before perusing following steps. See method for tissue sample homogenization.

7.1 Sample Preparation and Extraction

1. Open the homogenate sample container in a fume hood. Mix the sample thoroughly.

2. Weigh 10 $\pm$ 0.01 g aliquot of homogenized tissue sample into a 250 mL beaker, add 120 g anhydrous Na_2SO_4 and mix the tissue sample and Na_2SO_4 thoroughly with a stainless steel (SS) spatula. The sample should have a sandy texture at this point.

3. Determine the total percent solid by following the procedure outlined in Section 7.2.

4. Prepare a method blank by using 120 g Na_2SO_4 blended with 20-30g dry ice. A method blank must be prepared every 20 samples.

5. Prepare a matrix spike (MS) and a matrix spike duplicate (MSD) by weighing two additional 10 $\pm$ 0.01 g aliquots of homogenized tissue sample that was chosen for that purpose. Add 120 g anhydrous Na_2SO_4 to MS and MSD and mix thoroughly with SS spatula. The MS and MSD should have a sandy texture. The MS/MSD must be prepared every 10 samples.

6. Transfer the blank, MS and MSD, and tissue samples quantitatively to precleaned Soxhelet thimbles for extraction. (Note: one MS/MSD must be analyzed with every ten samples).

7. Place thimbles into Soxhelet extractors;

   - add 0.2 mL of surrogate spike solution to the Method Blank, the MS and MSD, and all the samples;

   - add 0.2 mL of pesticide matrix spike solution to each of the MS and MSD samples.

8. Add 250 mL methylene chloride and two boiling chips to each round bottom flask extractors.

9. Connect water cooled condensor and extract for 17 to 24 hours (ca. 60-90 cycles).

10. Allow the system to cool and filter entire sample extract into a 500 mL Erlenmeyer flask through a #541 Watman filter paper with anhydrous Na_2SO_4 packed into a powder funnel. Rinse the round bottom flask with three 10 mL portions of methylene chloride. Pass the rinsate through anhydrous Na_2SO_4 packed funnel and combine rinsate with sample extracts. The sample extract is ready for concentration.

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11. Extract Concentration - The sample extract may be concentrated using one of the following methods:

A. Kuderna-Danish (K-D) Method

1. Assemble a Kuderna-Danish (K-D) apparatus by attaching a 10-mL concentrator tube to a 500-mL evaporative flask.

2. Transfer the extract into a K-D concentrator flask; rinse the Erlenmeyer flask with 60 - 100 mL of methylene chloride to complete the quantitative transfer.

3. Add one or two clean boiling chips to the evaporative flask and attach a three-ball Snyder column.

4. Pre-wet the Snyder column by adding 2 - 3 mL of methylene chloride to the top. Place the K-D apparatus on a hot water bath (80 - 90°C) so that the concentrator tube is partially immersed in the hot water and the entire lower rounded surface of the flask is bathed with hot vapor.

5. Concentrate the extract down to less than 10 mL. Remove the K-D apparatus and allow it to drain and cool for at least 10 minutes.

6. Remove the Snyder column and rinse the flask and its lower joints into the concentrator tube with 1 - 2 mL of methylene chloride.

7. Evaporate the extract to final volume of 10 mL with a gentle stream of clean, dry nitrogen.

8. Take 1 mL for lipid determination as described in Section 7.3.

9. Transfer the remaining 9mL extract into a 12-mL test tube. The extract is ready for GPC cleanup. If the GPC cleanup is not performed immediately, the extract should be capped, protected from light and refrigerated at 4°C (± 2°C).

B. TurboVap II Method - Set Up TurboVap II as Follows:

1. Connect the gas supply

2. Set the Nitrogen Regulator to 30 PSI (NOTE: Instrument inlet pressure MUST NOT exceed 80 PSI).

3. Fill the water bath as follows:

a) place concentrator tubes in 5 positions

b) pour about 1 liter deionzed (DI) water through the empty position

c) add 15 drops of Clean Bath solution

d) add more DI water until the water surface is as high as the initial solvent level in the sample tube

e) DO NOT OPERATE THE INSTRUMENT WITHOUT WATER IN THE WATER BATH

4. Install the venting hose over the exhaust port, or place the instrument in the hood.

5. Turn the instrument ON.

6. Select the end point desire to one of the following positions:

a) TIME (minutes)

b) SENSOR

c) SENSOR & TIME

d) MANUAL

7. Set the WATER BATH temperature to 40°C (± 2°C) using the push wheel. (DO NOT OPERATE AT A TEMPERATURE GREATER THAN 60°C UNLESS THE SENSOR HAS BEEN REMOVED FROM THE INSTRUMENT.)

8. Set the GAS PRESSURE

a) pull the gas regulator knob out

b) slowly turn the regulator knob clockwise until swirling action without splashing is observed

c) the pressure reading should be between 8 to 15 PSI

d) push the knob in to lock in place

9. Place the sample in the instrument and press START/STOP button. When a cell raches its selected end point, the light next to its START/STOP BUTTON blinks and the beeper sounds briefly for 30 seconds.

10. Remove sample promptly and reconstitute to about 5 mL with *methylene chloride*.

11. Transfer the 5 mL extract into a 10 mL volumetric flask with a pasteur pipet.

12. Rinse the lower angle portion of concentrator tube with three 1 mL portions of methylene chloride by gently re-pipeting the 1 mL solvent in a circular motion and add the rinsate to the 10 mL volumentric flask and dlute to 10 mL.

13. Take 1 mL for lipid determination as described in Section 7.3.

14. Transfer the remaining 9 mL extract into a 12 mL test tube. The extract is ready for GPC cleanup. If GPC cleanup is not performed immediately, the extract should be capped, protected from light and refrigerated at 4°C (± 2°C).

7.2 Total Solids

Immediately after extracting samples, weigh 3-5 g of the homogenate tissue sample into a tared aluminum dish. Determine the total percent solid by drying in oven placed inside fume hood overnight at 105°C. Before weighing, allow them to cool in a dessicator. Concentrations of individual analytes will be reported relative to the dry weight of the homogenate tissue sample. Calculate the total percent solid using the following equation:

$$\% \text{ Total Solid} = \frac{\text{weight of dry sample (gms)}}{\text{weight of sample before drying (gms)}} \times 100\%$$

7.3 Lipid Determination

1. Transfer 1 mL of the 10 mL extract (Section 7.1, Step 11.A.9 or 11.B.14) into a preweighed 7.8 g (2 dram) vial and evaporate to dryness overnight.

2. Determine percent lipid gravimetrically.

3. Use remaining 9 mL extract for GPC cleanup.

7.4 Gel Permeation Chromatography (GPC) Extract Cleanup

GPC clean-up is required to separate the analytes from biological macromolecules (Lipids).

1. Transfer 5 mL extract onto the GPC column using the Zymark

2. Collect the fraction of extract eluting just after the lipid elution and before the sulfur elution [as determined by injecting a GPC calibration mixture comprised of corn oil, bis-(2-ethylhexyl)phthalate, methoxychlor, perylene, and sulfur] in a 200 mL collecting flask.

3. Transfer the clean extract quantitatively to either a K-D or TurboVap II system, solvent exchange with hexane and concentrate to 1 mL final extract volume (see Section 7.1, Step 11, A or B).

4. If florisil column cleanup or sulfur removal is necessary, proceed to Sections 7.5 or 7.6. Otherwise the extract is ready for GC/ECD analysis (Section 7.7).

7.5 Florisil Column Cleanup

1. Bake florisil for three to four hours in an oven at 400°C temperature. Allow it to cool to room temperature in dessicator.

2. Insert glass wool at the tip of chromatography column.

3. Rinse the column with ethyl ether and then with hexane to clean glassware from contamination.

4. Fill 2/3 of the column with baked florisil. Tap the column to settle the florisil. Add sodium sulfate on top of the Florisil until it is 1 cm deep.

5. Rinse the florisil column with ethyl ether followed by hexane. When the last added hexane is just above sodium sulfate, begin to collect eluent into a 50-mL test tube.

6. Add sample extract to the top of sodium sulfate using a disposable pipette. Rinse the extract container with 10 mL of hexane/ethyl ether mixture (1:1) and transfer it into the column. Collect the eluent; add another 40 mL of hexane/ethyl ether mixture to the column and keep collecting the eluent in the 50-mL test tube. Caution: Do not allow the column to go dry during the addition and elution of the sample extract.

7. Place the 50-mL test tube into N-Evap with warm water bath (35°C) and evaporate the solvent to 1 mL using gentle stream of clean, dry nitrogen.

7.6 Tetrabutylammonium (TBA) - Sulfite Cleanup (if needed after GPC & Florisil cleanup)

The solubility of sulfur in various solvent is very similar to the organochlorinated pesticides; therefore, the sulfur interference follows along with the pesticides through the normal extraction techniques. If the gas chromatograph is operated at the normal conditions for pesticide analysis, the sulfur interference can completely mask the region from the solvent peak through aldrin, a target compound. Tetrabutylammonium - sulfite is used to remove the sulfur interference.

1. Transfer the 1 mL extract described in Section 7.4, step 3, to a 50-mL clear glass bottle or vial with a Teflon-sealed screw cap.

2. Add 1.0 mL TBA-sulfite reagent and 2 mL 2-propanol; cap the bottle and shake for at least one minute. If the sample is colorless or if the initial color is unchanged, and if clear crystals (precipitated sodium sulfite) are observed, sufficient sodium sulfite is present. If the precipitated sodium sulfite disappears, add more TBA - sulfite reagent until a solid residue remains after repeated shaking.

3. Add 5 mL distilled water and shake for at least one minute. Allow the sample to stand for 5-10 minutes. Transfer the hexane layer (top) to a 50-mL test tube; add 1 or 2 mL of hexane and use the N-Evap to concentrate the extract to 1.0 mL. The extract is now ready for analysis by GC/ECD.

7.7 GC/ECD Conditions

Sample analyses are performed concurrently with the use of a Hewlett Packard (HP) 5890A or Hewlett Packard 5890 Series II GC equipped with dual injector, column, and electron capture detector capabilities.

The GC conditions used for the pesticides/PCBs analysis are listed below:

Injector Temperature	250°C
Oven Temperature Program	150°C hold for 1 min. 6.5°C/min to 260°C, hold for 22.08 min
Detector Temperature	320°C
Carrier Gas	Helium
Make-up Gas	Argon/Methane
Column Flow Rate	DB-608 3.2 mL/min; Rtx-1701 2.8 mL/min
Head Pressure	DB-608 3.3 psi; Rtx-1701 4 psi
30 second Purge Delay	
Data System	HP Chem Station

7.8 Retention Time Window Determination

1. Make three injections of all single component standard mixtures and multi-response products (i.e., PCBs and toxaphene) throughout the course of a 72-hour period. Serial injections over less than a 72-hour period result in retention time windows that are too tight.

2. Calculate the standard deviation of the three absolute retention times for each single component standard. For multi-response products, choose five major peaks from the chromatogram and calculate the standard deviation of the three retention times for each peak. The peaks chosen should be fairly immune to losses due to degradation and weathering in samples.

3. Plus or minus three times the standard deviation of the absolute retention times for each standard will be used to define the retention time window; however, the experience of the analyst should weigh heavily in the interpretation of chromatograms. For multi-response products (i.e., PCBs and toxaphene), the analyst can use the retention time window, but should rely primarily on pattern recognition.

4. In those cases where the standard deviation for a particular standard is zero, the analyst must substitute the standard deviation of a close eluting, similar compound to develop a valid retention time window.

5. The analyst must calculate the standard deviation of the retention times for each standard on each GC column and whenever a new GC column is installed. The data must be retained in the laboratory.

7.9 Standards and Samples Analysis

The analytical sequences listed in Appendix B must be followed.

7.9.1 Pesticide/PCB Analysis

For PCB-only or toxaphene-only analysis see Section 7.9.2. For toxaphene or PCB quantitation analysis, see Section 7.9.3.

1. Inject 2 µL of the Resolution Check Standard, and calculate the percent resolution between peaks.

$$\% \text{ Resolution} = \frac{\text{the depth of the valley between the peaks}}{\text{the peak height of the smaller peak being resolved}} \times 100\%$$

The % resolution must be $\geq$ 60% to continue the analysis.

2. Inject 2 µL of the PEM and calculate the percent breakdown (%BD) of 4,4'-DDT and endrin by using the following equations:

$$\text{4,4'-DDT \%BD} = \frac{\text{amount found in ng (DDD + DDE)}}{\text{amount in ng of 4,4'-DDT injected}} \times 100\%$$

$$\text{endrin \%BD} = \frac{\text{amount found in ng (endrin aldehyde + endrin ketone)}}{\text{amount in ng of endrin}} \times 100\%$$

$$\text{combined \%BD} = \text{4,4'-DDT \%BD + endrin \%BD}$$

The %BD of 4,4'-DDT must not exceed 20%.
The %BD of endrin must not exceed 20%.
The combined %BD must not exceed 30%.

Should either requirement not be met, corrective actions must be taken before further analysis can be continued.

NOTE: Since the response factors of all analytes are not available at this point, the amount found and the amount injected in the equation can be substituted by peak area or peak height. The percent breakdown must be recalculated by using the above mentioned equation after the average response factors are calculated by the five-point calibration.

3. Inject 2 µL of each of the single component calibration standards (five-point); tabulate peak height or peak area against the standard concentration. Calculate and tabulate the response factor (RF) of each compound at each standard concentration. The average RF and percent relative standard deviation (%RSD) must also be calculated.

$$RF = \frac{\text{Peak Area or Peak Height of the Analyte}}{\text{Mass injected (ng)}}$$

The %RSD of the RF for each analyte must be less than or equal to 20%, except as noted below. The % RSD for the two surrogates must be less than or equal to 30%. Up to two analytes (but not surrogates) per column may exceed the 20% RSD limit, but those analytes must have a %RSD of less than or equal to 30%.

4. Calculate the retention time (RT) windows for each analyte by using the following equation:

RT window = RT from the first calibration standard $\pm 3^{(1)} \times SD^{(2)}$

(1) from step 3 in this section
(2) SD denotes standard deviation; see Section 7.8, step 2.

All compounds (including surrogates) in the standards and in the sample extracts must elute within the specified RT windows.

5. Inject 2 µL of 500 ppb toxaphene standard; choose five dominant peaks to calculate the RT windows.

6. Inject 2 µL each of 500 ppb Ar 1016, Ar 1232, Ar 1248, Ar 1254, and Ar 1260 standards and 1 ppm Ar 1221 standard for the finger prints. Choose five dominant peaks from each Aroclor to calculate the RT windows.

7. Inject 2 µL of PEM; calculate the %BDs for 4,4'-DDT and endrin. Also calculate the combined %BD. The requirements specified in step 2 must be met. In addition, calculate the percent difference (%D) of each compound in the mixture by using the following equation:

$$\%D = \frac{|C_{nom} - C_{calc}|}{C_{nom}} \times 100\%$$

C_{nom} = nominal concentration of each analyte
C_{calc} = calculated concentration from the analysis of the standard

The %D must be less than or equal to 25% for all compounds in the mixture. Tabulate the results.

NOTE: This PEM injection starts the 12-hour clock.

8. Inject 2 µL each of a group of sample extracts. It is a good practice to inject the method blank first to monitor the possible lab contamination. **All sample extracts must be injected within 12 hours of the injection of PEM (step 7).**

9. At the end of the 12-hour period, inject 2 µL of 100 ppb pesticide standards as another calibration verification (continuing calibration check). Calculate and tabulate the %D for all compounds. All compounds must have a %D less than or equal to 25%.

10. Inject 2 µL each of another group of sample extracts. **They must be injected within 12 hours of the injection of the 100 ppb pesticide standard described in step 9.**

11. Repeat steps 7, 8, 9, and 10 until such a time as any of the PEM or the 100 ppb pesticide standard fails to meet the %BD or the %D requirement. Please note that the PEM is used to check both %BD and %D.

12. End the analytical sequence with a PEM or the alternating standard, a 100 ppb pesticide standard, whichever should be injected next.

7.9.2 Quantitation Analysis of Toxaphene and/or PCBs

Any identified toxaphene and/or Aroclors in the analysis described in Section 7.9.1 must be quantitated by the proper calibration curve (five-point).

1. Inject 2 µL of the Resolution Check Mixture to verify the column performance. See Section 7.9.1, step 1 for QC requirements.

2. Inject 2 µL of PEM to calculate the %BD of 4,4'-DDT and endrin. The combined % BD should also be calculated. See Section 7.9.1, step 2 for QC requirements. Use peak height or peak area to calculate %BD.

3. Inject 2 µL each of the Aroclor standards or toxaphene standard to be quantitated at concentrations specified in Section 6.0, Item 13. Choose a minimum of five dominant peaks to calculate the RFs by using the equation specified in Section 7.9.1, step 3. The average RF and % RSD of each peak can then be calculated. The % RSD of each peak must be less than or equal to 20%. The RF can also be calculated by using the total response of the five peaks. The % RSD must be less than or equal to 20%.

   NOTE: If more than one Aroclor needs to be quantitated, proper calibration (five-point) standards must be injected.

4. Calculate the RT windows of the same dominant peaks as chosen in Section 7.8, step 2. Use the equation specified in Section 7.9.1, step 4.

5. Inject 2 µL of 500 ppb toxaphene standard or 500 ppb specific Aroclor standard (or 1 ppm Ar 1221) to calculate the %D according to the equation specified in Section 7.9.1, step 7. The percent difference must be less than or equal to 25%. This injection serves as a continuing calibration check and starts the 12-hour clock.

6. Inject 2 µL each of the sample extracts that contain toxaphene and/or specific Aroclor(s). All injections must be made within 12 hours of the continuing calibration check analysis (step 5).

7. Repeat steps 5 and 6 if necessary.

8. End the analytical sequence by injecting 2 µL of the 500 ppb toxaphene standard or 500 ppb specific Aroclor standard (1 ppm Ar 1221).

7.9.3 PCB Only Analysis

1. Follow steps 1 and 2 of Section 7.9.1.

2. Inject 2 µL each of the Aroclor calibration standards at the concentration specified in Section 6.0 Item 11. The Aroclor used for matrix spike must be calibrated. Choose five dominant peaks to calculate RFs by following Section 7.9.2, step 3.

3. Inject 2 µL each of the remaining Aroclor standards for fingerprints at the concentration specified in Section 7.9.1, step 6.

4. Calculate the RT windows of each Aroclors injected in steps 2 and 3 by using the equation specified in Section 7.9.1, step 4. The five peaks chosen for calculation must be the same peaks chosen in Section 7.8, step 2.

5. Inject 2 µL of the continuing calibration check standard, which is the mid-point calibration standard in step 2. Calculate and tabulate the %D of each peak. Use the equation specified in Section 7.9.1, step 7. The percent difference must be less than or equal to 25%.

   NOTE: This injection starts the 12-hour period for sample analysis.

6. Inject 2 µL each of a group of sample extracts. It is a good practice to inject a method blank first to monitor any possible lab contamination. All sample extracts must be analyzed within 12 hours of the injection of the continuing calibration standard (step 5).

7. Repeat steps 5 and 6, if necessary, until the %D requirement of the continuing calibration check fails.

8. End the sequence with the continuing calibration check standard. The percent difference requirement is not applied.

7.10 Evaluation of Chromatograms

All standard and sample chromatograms must be evaluated to decide if re-injection and/or dilution is necessary.

7.10.1 Chromatograms of Standards

The following requirements apply to all data presented for single component and multicomponent (toxaphene/PCBs) analytes.

1. The chromatograms that result from the analyses of the standards must display the single component analytes present in each standard at greater than 10% of full scale but less than 100% of full scale.

2. The chromatograms of the standards for the multicomponent analytes must display the peaks chosen for identification of each analyte at greater than 25% and less than 100% of full scale.

3. For any standard containing alpha-BHC, the baseline of the chromatogram must return to below 50% of full scale before the elution time of alpha-BHC, and return to below 25% of full scale after the elution time of alpha-BHC and before the elution time of decachlorobiphenyl.

4. If a chromatogram is replotted electronically to meet requirements, the scaling factor used must be displayed on the chromatograms.

5. If the chromatogram of any standard needs to be replotted electronically to meet these requirements, both the initial chromatogram and the replotted chromatogram must be submitted in the data package.

6. If a chromatogram shows carryover from the previous injection, samples analyzed afterward must be reanalyzed, preferably immediately.

7. The retention time of each single component analyte must fall within the RT windows determined in Section 7.9.1, step 4. If the retention time shifts outside the RT window by more than 0.5 minutes, the analytical sequence (acquisition) must be interrupted for corrective action. After corrective action, the acquisition can only be resumed by an acceptable PEM analysis. A new RT window might need to be defined by injecting a 100 ppb pesticide standard.

7.10.2 Chromatograms of Sample Analyses

The following requirements apply to all data presented for single component and multicomponent analytes.

1. When no analytes are identified in a sample, the chromatograms from the analyses of the sample extract must use the same scaling factor as was used for the low point standard of the initial calibration associated with those analyses.

2. Chromatograms must display single component pesticides detected in the sample at less than full scale.

3. Chromatograms must display the largest peak of any multicomponent analyte detected in the sample at less than full scale.

4. If an extract must be diluted, chromatograms must display single component pesticides between 10% and 100% of full scale.

5. If an extract must be diluted, chromatograms must display the peaks chosen for quantitation of multicomponent analytes between 25% and 100% of full scale.

6. For any samples, the baseline of the chromatogram must return to below 50% of full scale before the elution time of alpha-BHC, and return to below 25% of full scale after the elution time of alpha-BHC and before the elution time of decachlorobiphenyl.

7. If a chromatogram is replotted electronically to meet requirements, the scaling factor used must be displayed on the chromatograms.

8. If the chromatogram of any standard needs to be replotted electronically to meet these requirements, both the initial chromatogram and the replotted chromatogram must be submitted in the data package.

9. If sample chromatograms have interfering peaks, a high baseline, or off-scale peaks, those samples must be reanalyzed following dilution, further cleanup, or reextraction. Samples which cannot be made to meet the given specifications after one reextraction and cleanup must be reported in the case narrative and do not require further analysis. No limit is placed on the number of reextractions of samples that may be required because of contaminated method blanks.

7.10.3 Pesticide/PCB Identification

The identification of single component pesticides by gas chromatographic methods is based primarily on retention time data. The retention time of the apex of the peak can be verified only from an on-scale chromatogram. The identification of multicomponent analytes is based primarily on pattern recognition, which can only be verified from an on-scale chromatogram.

1. Analytes are identified when peaks are observed in the RT windows for the compound on both GC columns. Toxaphene and Aroclors are identified when patterns are observed on both GC columns.

2. If a peak is just slightly outside any target compound's RT window, examine the retention time of the closest surrogate. Use surrogates to evaluate a possible RT shift. Similar RT shifts of target compounds can be expected in some cases.

3. If a sample contains interfering peaks or a high baseline, a further cleanup might be necessary. Compound identification on this kind of sample can be difficult. Information like surrogate retention time and peak ratio on both GC columns must be evaluated for identification purposes.

7.11 Sample Dilution

No target compound concentrations may exceed the upper limit of the initial calibration range. If analytes are detected at a level greater than the highest calibration standard, samples must be either diluted to a maximum of 1:100,000 or until the analyte response is within the linear range established during calibration. Guidance in performing dilutions and exceptions to this requirement are given below.

1. If the analyst has reason to believe that diluting the final extracts will be necessary, an undiluted run may not be required. However, if no peaks are detected above 25% of full scale, analysis of a 10 times more concentrated sample extract or the undiluted sample extract is required.

2. If the response is still above the highest calibration point after the dilution of 1:100,000, the analyst should contact the group leader immediately for further instruction.

3. The results of the original analysis are to be used to determine the approximate dilution factor required to get the largest analyte peak within the initial calibration range.

4. The dilution factor chosen should keep the response of the largest peak for a target compound in the upper half of the initial calibration range of the instrument.

5. Do not submit data for more than two analyses, i.e., the original sample extract and one dilution, or, if a screening procedure was employed, from the most concentrated dilution analyzed and one further dilution.

6. All chromatograms of dilution analyses must meet the requirements described in Section 7.10.2.

8.0 CALCULATIONS

Quantitation of target compounds and surrogates can be performed on any column that passed all the quality control (QC) criteria specified in this SOP. In order to be quantitated, the detector response (peak area or peak height) of all the analytes must lie within the calibration range.

8.1 Quantitation Limit (QL)

$$QL\ (ug/kg) = \frac{C_{ext} \times V_t \times DF}{W_s \times S}$$

where,

C_{std} = Concentration of the lowest standard in the calibration range (ug/mL)
W = Weight of soil/sediment extracted (kg)
DF = Dilution Factor
V_t = Volume of the extract (mL)
S = Decimal percent solid

The quantitation limit of each analyte can be found in Appendix A.

8.2 Sample Concentration

$$\text{Concentration ug/kg} = \frac{(A_x)(V_t)(DF)}{(RF_{Avg})(W)(V_i)(S)}$$

where,

A_x = Peak area or peak height for the compound to be measured
RF_{Avg} = Average response factor
W = Weight of soil/sediment extracted (kg)
V_i = Volume of extract injected (uL)
V_t = Volume of the concentrated extract (mL)
DF = Dilution factor
S = Decimal percent solid

The quantitation of toxaphene or Aroclors must be accomplished by comparing the heights or the areas of each of the five major peaks of the multicomponent analyte in the sample with the average response factor for the same peaks established during the initial calibration sequence. The concentration of multicomponent analytes is calculated by using the above mentioned equation, where A_x is the height or area for each of the major peaks of the multicomponent analyte. The concentration of each peak is determined, and then a mean concentration for five major peaks is calculated.

If more than one multicomponent analyte is observed in a sample, the analyst must choose separate peaks to quantitate the different multicomponent analytes. A peak common to both analytes present in the sample must not be used to quantitate either compound.

NOTE: If any analytes are detected below the quantitation limit, they are to be reported as present below the quantitation limit and flagged as estimated (J).

8.3 Surrogate Spike Recoveries

$$\text{Percent Recovery} = \frac{Q_d}{Q_a} \times 100\%$$

where,

Q_d = Quantity determined by analysis
Q_a = Quantity added to sample

8.4 Matrix Spike Recoveries

The percent recoveries and the relative percent difference (RPD) between the recoveries of each of the six compounds in the matrix spike samples will be calculated and reported by using the following equations:

$$\text{Percent Matrix Spike Recovery} = \frac{SSR - SR}{SA} \times 100\%$$

where,

SSR = Spike sample result
SR = Sample result
SA = Spike added

$$RPD = \frac{|MSR - MSDR|}{(MSR + MSDR)/2} \times 100\%$$

where,

RPD = Relative percent difference
MSR = Matrix spike recovery
MSDR = Matrix spike duplicate recovery

The vertical bars in the formula above indicate the absolute value of the difference; hence, RPD is always expressed as a positive value.

9.0 QUALITY ASSURANCE/ QUALITY CONTROL

9.1 GC Column Performance

The purpose of this resolution check is to demonstrate that at the time of the initial calibration, the GC column is capable of chromatographically resolving the target compounds. This is accomplished through the analysis of the Resolution Check Mixture, which contains the nine target compounds that are most difficult to resolve.

1. The Resolution Check Mixture must be analyzed at the beginning of every initial calibration sequence, on each GC column and instrument used for analysis.

2. The percent resolution must be greater than or equal to 60% before standards, samples, or blanks can be analyzed.

9.2 Initial Calibration for Target Compounds and Surrogates

Prior to the analysis of samples and method blank(s), the GC/EC system must be initially calibrated at a minimum of five concentrations to determine the linearity range of all the target compounds.

1. The concentration of all calibration standards that are specified in Section 6.0 must be used.

2. The standards are to be analyzed according to the procedures given in Section 7.9 using the GC operating conditions in Section 7.7. Appendix B summarizes the specific analysis sequence to be followed.

3. The response factors are determined according to the procedure in Section 7.9.

4. The calibration is evaluated on the basis of the extent of breakdown of endrin and 4,4'-DDT, as described in Section 7.9.1, step 2. The breakdown of each compound must not exceed 20%; the combined breakdown must not exceed 30%.

5. The calibration is also evaluated on the basis of the stability of the response factors of each target compound and surrogate. The % RSD for each target compound must not exceed 20%, except as noted below.

   - The % RSD for the two surrogates must not exceed 30%.
   - Up to two single component analytes (but not surrogates) per column may exceed the 20% RSD limit, but those analytes must have a % RSD less than or equal to 30%.

9.3 Continuing Calibration for Target Compounds and Surrogates

Once the GC/EC system has been calibrated, the calibration must be verified each 12-hour time period for each GC column and instrument used for analysis. The calibration is verified through the analysis of PEM and the mid point concentrations of pesticide, Aroclor, or toxaphene standards (100 ppb pesticide standard, 500 ppb Aroclor standard, or 500 ppb toxaphene standard).

1. The continuing calibration is evaluated on the basis of the stability of the retention times of the target compounds in the standards. The retention times of all single component analytes and surrogates in the standards must be within the RT windows established in Section 7.9.1, step 4.

2. The continuing calibration is evaluated on the basis of the stability of the instrument response to the target compounds in the PEM and the mid point standard, as judged by the reproducibility of the determinations of the concentrations of these compounds in the standard, as described in Section 7.9.1, steps 7 and 9.

   The %D of all target compounds and surrogates must not exceed 25%.

3. The continuing calibration is evaluated on the basis of the extent of the breakdown of the two target compounds endrin and 4,4'-DDT, in the PEM, as described in Section 7.9.1, step 2.

4. The continuing calibration is evaluated on each GC column and instrument used for analysis.

9.4 Determination of Retention Time Windows

The identification of single component pesticides by gas chromatographic methods is based primarily on retention time data. The identification of multicomponent analytes is based primarily on recognition of patterns of retention times displayed on a chromatogram. Therefore, the determination of retention time windows is crucial to the provision of valid data for these target compounds.

1. The identification of all target compounds analyzed by this analytical procedure is based on the use of absolute retention time.

2. The retention time window of each target compound peak is determined as described in Section 7.9.1, step 4.

3. The retention time shifts of the surrogates are used to evaluate the stability of the gas chromatographic system during analysis of samples and standards. The retention time of the surrogates must be within the retention time windows determined by Section 7.9.1, step 4.

4. If the confirmation analysis is required for any analytes, retention time windows of those analytes must also be determined and tabulated for the confirmation column by using the procedure described in section 7.9.1, step 4. All the requirements mentioned above must also be met.

9.5 Analytical Sequence

The standards and samples analyzed by this analytical procedure must be analyzed in a sequence described in Section 7.9 (also Appendix B). This sequence includes requirements that apply to the initial and continuing calibrations, as well as to the analysis of samples.

9.6 Method Blank

A method blank is a weight of a clean reference matrix (120g Na_2SO_4 blended with 20-30 g dry ice) that is carried through the entire analytical procedure. The weight of the reference matrix must be approximately equal to the weight of samples associated with the blank. The purpose of a method blank is to determine the levels of contamination associated with the processing and analysis of samples.

1. A method blank must be prepared each 20 samples and analyzed on each GC/ECD system used to analyze samples.

2. A method blank must not contain any of the compounds listed in Appendix A at greater than the quantitation limit.

3. The surrogate retention times must be within the RT windows calculated from Section 7.9.1, step 4.

4. All samples associated with an unacceptable method blank must be reextracted and then reanalyzed.

9.7 Surrogate Recoveries

The recoveries of the two surrogates are calculated from the analysis of each sample, blank, and MS/MSD. The purpose of the surrogates is to evaluate the preparation and analysis of samples.

1. The surrogates are added to each sample, blank, matrix spike, and matrix spike duplicate prior to extraction at the concentrations described in Sections 6.0 and 7.1

2. The recoveries of the surrogates are calculated according to the procedures in Section 8.3.

3. The quality control limits for surrogate recovery are 60 - 150%. These limits are only advisory, and no further action is required if the limits are exceeded. However, frequent failures to meet the limits for surrogate recovery warrant investigation by the laboratory.

9.8 Matrix Spike and Matrix Spike Duplicate Analysis

The purpose of spiking target compounds into two aliquots of a sample is to evaluate the effects of the sample matrix on the methods used in this analytical procedure.

1. The MS/MSD must be prepared every 10 samples per matrix with each project.

2. The mixture of pesticide standard specified in Section 6.0 must be used to result in the concentration specified in Section 7.1

3. The recoveries of the matrix spike compounds are calculated according to the procedures in Section 8.4. The relative percent difference for each spiked analyte between the results of the matrix spike and the matrix spike duplicate are calculated according to the procedures in Section 8.4.

4. The quality control limits for recovery and relative percent difference are given below. These limits are only advisory at this time, and no further action is required when the limits are exceeded.

Compound	% Recovery	RPD
gamma-BHC	46 - 127	50
Heptachlor	35 - 130	31
Aldrin	34 - 132	43
Dieldrin	31 - 134	38
Endrin	42 - 139	45
4,4'-DDT	23 - 134	50

9.9 Dilution Analysis

If the concentration of any sample extract exceeds the initial calibration range, that sample extract must be diluted and reanalyzed as described in Section 7.11. If no peaks are detected above 25% of the full scale in the dilution analysis, a more concentrated sample extract must be analyzed.

10.0 DATA VALIDATION

Data validation will be performed by the Analytical Project Control Group, and therefore, it is not applicable to this analytical procedure. However, data is considered satisfactory for submission purposes when ALL the requirements mentioned below are met.

1. All samples must be analyzed as part of a valid analytical sequence, i.e., they must be analyzed under an acceptable peak resolution check, degradation check, initial calibration, and continuing calibration check.

2. Analyte RT windows must be submitted for both analytical columns if confirmation analysis is required.

3. The retention times for both surrogates in every standard and sample must be within the defined RT windows for both columns.

4. All the QC requirements described in Section 9.0 must be met all the time.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, refer to U.S. EPA, OSHA and corporate health and safety practices. More specifically, refer to ERT/REAC SOP #3013, REAC Laboratory Safety Program.

12.0 REFERENCES

Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Third Edition, SW-846, September 1986.

U.S. EPA Contract Laboratory Program (CLP), Statement of Work for Organic Analysis, Document Number OLM01.0 (including revisions through OLM01.8).

U.S. EPA Bioaccumulation Monitoring Guidance: Analytical Methods for U.S. EPA Priority Pollutants and 301(b) Pesticides in Tissues from Estuarine and Marine Organisms (May, 1988). Prepared by Tetra Tech, Inc.

PESTICIDES/PCBS ANALYSIS OF
TISSUE SAMPLES BY GC/ECD

APPENDIX A
Target Compound List and Quantitation Limits
Method T1809L
October, 1992

PESTICIDES/PCBS ANALYSIS OF TISSUE SAMPLES BY GC/ECD

Target Compound List and Quantitation Limits[1]

COMPOUND	QL[2] (ug/kg)
a-BHC	4
g-BHC	4
b-BHC	4
Heptachlor	4
d-BHC	4
Aldrin	4
Heptachlor epoxide	4
Endosulfan I	4
p,p'-DDE	4
Dieldrin	4
Endrin	4
p,p'-DDD	4
Endosulfan II	4
p,p'-DDT	4
Endrin aldehyde	4
Endosulfan sulfate	4
Methoxychlor	4
Endrin Ketone	4
Toxaphene	20
a-Chlordane	4
g-Chlordane	4
Arochlor 1016	20
Arochlor 1221	40
Arochlor 1232	20
Arochlor 1242	20
Arochlor 1248	20
Arochlor 1254	20
Arochlor 1260	20

(1) On a wet-weight basis

(2) QL denotes Quantitation Limits

PESTICIDES/PCBS ANALYSIS OF
TISSUE SAMPLES BY GC/ECD

APPENDIX B
Analytical Sequences
Method T1809L
October, 1992

PESTICIDES/PCBS ANALYSIS OF TISSUE SAMPLES BY GC/ECD

Analytical Sequences

Pesticides/PCBs Analytical Sequence (for Section 7.9.1)

Time	Injection #	Material Injected
	1	Resolution Check
	2	Performance Evaluation Mix (PEM)
	3 - 15	Standards; including 5-point std and toxaphene and PCBs; %RSD and RT window will be calculated
0 hr.	16	PEM
	17	1st Sample
	:	
	:	Subsequent Samples
	:	
12 hr.	o	Continuing Calibration Check Std (100 ppb Pesticide Std)
	:	
	:	Samples
	:	
another 12 hr.	o	PEM
	:	
	:	Samples
	:	
another 12 hr.	o	Continuing Calibration Check Std (100 ppb Pesticide Std)
	:	
	:	Samples
	:	
	etc.	
	last	PEM or continuing calibration check std (100 ppb Pesticide Std)

NOTE: All subsequent 12-hour periods are timed from the injection of the PEM or the mid point concentration standard. The analytical sequence must end with a PEM or a continuing calibration check standard.

The toxaphene and PCB standards must be analyzed at concentrations specified in Section 7.9.1, steps 5 and 6.

PESTICIDES/PCBS ANALYSIS OF TISSUE SAMPLES BY GC/ECD

Analytical Sequence for Toxaphene/PCB Quantitation Analysis (for Section 7.9.2)

Time	Injection #	Material Injected
	1	Resolution Check
	2	Performance Evaluation Mix (PEM) for breakdown check only
	3 - n	5-point of toxaphene Stds or 5-point of Aroclor Stds to be Quantitated
0 hr.	n+1	500 ppb toxaphene Std or 500 ppb Aroclor Std (1 ppm Std for Ar 1221)
	n+2	1st Sample
	:	
	:	Subsequent Samples
	:	
12 hr.	o	500 ppb toxaphene Std or 500 ppb Aroclor Std (1 ppm for Ar 1221)
	:	
	:	Samples
	:	
another 12 hr.	o	500 ppb toxaphene Std or 500 ppb Aroclor Std (1 ppm for Ar 1221)
	:	
	:	Samples
	:	
another 12 hr.	o	500 ppb toxaphene Std or 500 ppb Aroclor Std (1 ppm for Ar 1221)
	:	
	:	Samples
	:	
	etc.	
	last	500 ppb toxaphene Std or 500 ppb Aroclor Std (1 ppm for Ar 1221)

NOTE: All subsequent 12-hour periods are timed from the injection of the mid point concentration standard. The analytical sequence must be ended with a continuing calibration check standard (500 ppb toxaphene Std or 500 ppb Aroclor Std [1 ppm Std for Ar 1221]).

PESTICIDES/PCBS ANALYSIS OF
TISSUE SAMPLES BY GC/ECD

Analytical Sequence for PCB Only Analysis (for Section 7.9.3)

Time	Injection #	Material Injected
	1	Resolution Check
	2	Performance Evaluation Mix (PEM) for breakdown check only
	3 - 13	5-point Stds. of Ar 1260 or spiked Aroclor; other Aroclor at Conc. Specified in 7.9.1, step 6.
0 hr.	14	Continuing calibration check Std (mid point Std) - Ar 1260 or spiked Aroclor
	15	1st Sample
	:	
	:	Subsequent Samples
	:	
12 hr.	o	Continuing calibration check std (mid point Std) - Ar 1260 or spiked Aroclor
	:	
	:	Samples
	:	
another 12 hr.	o	Continuing calibration check std (mid point Std) - Ar 1260 or spiked Aroclor
	:	
	:	Samples
	:	
another 12 hr.	o	Continuing calibration check std (mid point Std) - Ar 1260 or spiked Aroclor
	:	
	:	Samples
	:	
	etc.	
	last	Continuing calibration check std (mid point Std) - Ar 1260 or spiked Aroclor

NOTE: All subsequent 12-hour periods are timed from the injection of the mid point standard. The analytical sequence must be ended with a continuing calibration check standard.

APPENDIX C
MICHIGAN DNR SPECIMEN FIELD DATA SHEETS

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / (MUSKRAT) [ONDATRA ZIBETHICA]

SPECIMAN ID.: BC370202MR CATALOG: 081193BC370202MR SITE: Battle Creek control

DATE COLLECTED; 8/11/93 SPECIES; Muskrat SEX; F

TOTAL LENGTH; 595mm TAIL; 236mm HINDFOOT; 71mm [RIGHT] EAR; 11mm [RIGHT]

TOTAL BODY WEIGHT; 1339gm

TRAP TYPE; Connibear TRAP NUMBER; BC37 COLLECTOR; M. H.

EXTERNAL NOTES; Normal

REPRODUCTIVE;

PARASITES; SAVED?

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION; inactive

PARASITES; None SAVED?

OTHER ABNORMALITIES; minor discoloration left* cranial edge of left lobe of liver. 1 yellow colored spot (2.5mm diam) on caudal rt. lobe of liver, also aspherical*

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 630g

LIVER SAMPLE WEIGHT; C.4* C.2

KIDNEY TOTAL WEIGHT

RIGHT KIDNEY; 4.9g

LEFT KIDNEY; 5.3g

KIDNEY SAMPLE WEIGHT; 2.4g

SPECIAL COMMENTS;

* sample with cyst

EAR MEASUREMENT; INTERIOR POINT OF TRAGUS TO EXTERIOR POINT OF APEX

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

CH / ML 8/11/93

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: BC270305MR CATALOG: 081293BC270305MR SITE: Battle Creek

DATE COLLECTED; 08/12/93 SPECIES; see above SEX; M

TOTAL LENGTH; 480mm TAIL; 189mm HINDFOOT; 69mm [RIGHT] EAR; 25mm [RIGHT]

TOTAL BODY WEIGHT; 707g

TRAP TYPE; Leghold TRAP NUMBER; BC27 COLLECTOR; M.H.

EXTERNAL NOTES;

REPRODUCTIVE; Normal

PARASITES; SAVED?

OTHER ABNORMALITIES; Lower jaw - left incisor broken off

INTERNAL NOTES;

REPRODUCTION;

PARASITES; Normal SAVED?

OTHER ABNORMALITIES; Left codal liver lobe a pale white discoloration.

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 26.7g

LIVER SAMPLE WEIGHT; 0.3g

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY; 1.8g
LEFT KIDNEY; 1.9g

KIDNEY SAMPLE WEIGHT; 0.9g

SPECIAL COMMENTS;

EAR MEASUREMENT; INTERIOR POINT OF TRAGUS TO EXTERIOR POINT OF APEX

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

Chad A Kil 8/12/93

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: BC 380203MR CATALOG: 081193 BC 380203 mr SITE: Battle Creek Control

DATE COLLECTED; 8/11/93 SPECIES; Muskrat SEX; M (immature)

TOTAL LENGTH; 515 mm TAIL; 203 mm HINDFOOT; 70mm [RIGHT] EAR; 13 mm [RIGHT]

TOTAL BODY WEIGHT; 892 gm

TRAP TYPE; Leg Hold TRAP NUMBER; BC38 COLLECTOR; M. H

EXTERNAL NOTES; Food in mouth

REPRODUCTIVE;

PARASITES; SAVED?

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION; immature

PARASITES; tape worm life cycle SAVED?

OTHER ABNORMALITIES; white modeling on both kidneys 3 focal lesions, spherical in design, smallest is 5mm, 10mm (med), 3mm (largest) diameter

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 38.4g

LIVER SAMPLE WEIGHT; 0.7g * 0.5g

KIDNEY TOTAL WEIGHT

RIGHT KIDNEY; ~~5.1g~~ HK 4.5g

LEFT KIDNEY; 4.7g

KIDNEY SAMPLE WEIGHT; 1.9g

SPECIAL COMMENTS;

Simple with lesion

EAR MEASUREMENT; INTERIOR POINT OF TRAGUS TO EXTERIOR POINT OF APEX

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

CH / MCL 8/11/93

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / (MUSKRAT) [ONDATRA ZIBETHICA]

SPECIMAN ID.: BC370202MR CATALOG: 081193BC370202MR SITE: Battle Creek control

DATE COLLECTED: 8/11/93 SPECIES: Muskrat SEX: F

TOTAL LENGTH: 595mm TAIL: 236mm HINDFOOT: 71mm [RIGHT] EAR: 11mm [RIGHT]

TOTAL BODY WEIGHT: 1339gm

TRAP TYPE: Connibear TRAP NUMBER: BC37 COLLECTOR: M. H.

EXTERNAL NOTES: Normal

REPRODUCTIVE;

PARASITES; SAVED?

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION; inactive

PARASITES; None SAVED?

OTHER ABNORMALITIES; minor discoloration ~~left~* cranial edge of left lobe of liver, 1 yellow colored spot (2.5mm x 3mm) on caudal rt. lobe of liver, also aspherical

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 630g

LIVER SAMPLE WEIGHT; C.4* C.2

KIDNEY TOTAL WEIGHT

RIGHT KIDNEY; 4.9g

LEFT KIDNEY; 5.3g

KIDNEY SAMPLE WEIGHT; 2.4g

SPECIAL COMMENTS;

* sample was split

EAR MEASUREMENT; INTERIOR POINT OF TRAGUS TO EXTERIOR POINT OF APEX

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

CH / ML 8/11/93

Specimen Identification No. BC370202MR

Catalog No. 061193BC370202MR

Site Name API-PC-KR

Day 11 Mo. 08 Year 93 Time of Collection 1140

Sex M (F) Genus Ondatra Species (Muskrat) Z. hudsonicus

TL 565 mm Tail 236 mm HF 71 mm Ear 11 mm Wt. 1339 gm.

Collector Mike Harris Trap No. BC37

Trap Type Conibear Live (Dead)

REPRODUCTIVE DATA:

MALE- Testis: L _____ W _____ Wt. _____

Seminal Vesicles: *Minute* *Small* *Large* Epididymis: *Convoluted* *Not Conv.*

FEMALE- Embryos R _____ L _____ Crown Rump _____ *Saved* *Discarded*

Placental Scars R _____ L _____ Corpora Lutea R _____ L _____

Mammary Development: *Small* *Large* *Lactating* Ovary Wt. _____

Vagina: *Inactive* *Cornified* *Turgid* *Plugged*

Reproductive Stage: *Nulliparous* *Semiparous* *Multiparous*

Comments: _____

SPECIAL COLLECTIONS:

Ectoparasites: Y N _____ *SAVED* *DISCARDED*

Endoparasites: Y N _____ *SAVED* *DISCARDED*

Stomach Contents: Y N _____ *SAVED* *DISCARDED*

Other- _____ _____ *SAVED* *DISCARDED*

Other- _____ _____ *SAVED* *DISCARDED*

ORGAN	WEIGHTS	HISTO. SAVED	PRESERVATIVE (SEE BELOW)	ABNORMALITIES/ COMMENTS
Liver	63.6 gms	(Y) N	1	
Spleen		Y N		
Kidney	L 5.3 R 4.9 C	(Y) N	1	
Adrenal	L R C	Y N		
		Y N		
		Y N		

PRESERVATIVE: 1) 4% BUFFERED PARAFORMALDEHYDE, 2) BOUINS, 3) ALCOHOL, 4) _____, 5) _____

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / ~~MUSKRAT~~ [ONDATRA ZIBETHICA]

SPECIMAN ID.: BC380306MR CATALOG: 081293BC380306MR SITE: Battle Creek

DATE COLLECTED; SPECIES; see above SEX; M

TOTAL LENGTH; ~~HF~~ 504mm TAIL; 208mm HINDFOOT; 70mm [RIGHT] EAR; 27mm [RIGHT]

TOTAL BODY WEIGHT; 839gm

TRAP TYPE; Leghold TRAP NUMBER; BC38 COLLECTOR; M.H.

EXTERNAL NOTES;

REPRODUCTIVE; Normal

PARASITES; SAVED?

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION; Normal

PARASITES; SAVED?

OTHER ABNORMALITIES; 8 mm diameter lesion rt. codal lobe, medial.

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 30.9g

LIVER SAMPLE WEIGHT; 0.3g * 0.4g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 2.0g

LEFT KIDNEY; 2.2g

KIDNEY SAMPLE WEIGHT; 1.1g

SPECIAL COMMENTS;

* sample w/ lesion

EAR MEASUREMENT; INTERIOR POINT OF TRAGUS TO EXTERIOR POINT OF APEX

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

CHL / JKL 5/12/93

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK/MUSKRAT

SPECIMAN ID.: BC21010IMR CATALOG: 081093BC21010IMR SITE: Battle Creek, Reference Site

DATE COLLECTED; 8-10-93 SPECIES; ONDATRA ZIBETHICA SEX; Male

TOTAL LENGTH; 614mm TAIL; 280mm HINDFOOT; 87mm Right (pad to pad) EAR*; 28mm (Right)

TOTAL BODY WEIGHT; 1513 grams

TRAP TYPE; Leghold TRAP NUMBER; BC21 COLLECTOR; Mike Harris + Heather Kirschmann

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; None SAVED?

OTHER ABNORMALITIES; None

INTERNAL NOTES;

REPRODUCTION;

PARASITES; No SAVED?

OTHER ABNORMALITIES; 2 minor discolorations on liver 4mm DIA EACH PALE AREAS SURFACE

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 56.62 grams HK

LIVER SAMPLE WEIGHT; 0.3 grams

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY; 4.1 grams
LEFT KIDNEY; 4.5 grams

KIDNEY SAMPLE WEIGHT; 2.0 grams

SPECIAL COMMENTS;

* Tip of ear to distal surface of ear canal

CM / MAL 8/10/93

Specimen Identification No. BC210101MR

Catalog No. 081093BC210101MR

Site Name API-PC-KR

Day 10 Mo. 08 Year 93 Time of Collection 1250

Sex (M) F Genus Ondatra Species (Muskrat) Zibethicus

TL 614 mm Tail 280 mm HF 67 mm Ear 28 mm Wt. 1513 gms

Collector Mike Harris Trap No. BC21

Trap Type stoploss Leghold Victor #1 Live (Dead)

REPRODUCTIVE DATA:

MALE- Testis: L _____ W _____ Wt. _____

Seminal Vesicles: *Minute* *Small* *Large* Epididymis: *Convoluted* *Not Conv.*

FEMALE- Embryos R _____ L _____ Crown Rump _____ *Saved* *Discarded*

Placental Scars R _____ L _____ Corpora Lutea R _____ L _____

Mammary Development: *Small* *Large* *Lactating* Ovary Wt. _____

Vagina: *Inactive* *Cornified* *Turgid* *Plugged*

Reproductive Stage: *Nulliparous* *Semiparous* *Multiparous*

Comments: _____

SPECIAL COLLECTIONS:

Ectoparasites: Y N _____ *SAVED* *DISCARDED*

Endoparasites: Y N _____ *SAVED* *DISCARDED*

Stomach Contents: Y N _____ *SAVED* *DISCARDED*

Other- _____ _____ *SAVED* *DISCARDED*

Other- _____ _____ *SAVED* *DISCARDED*

ORGAN	WEIGHTS	HISTO. SAVED	PRESERVATIVE (SEE BELOW)	ABNORMALITIES/ COMMENTS
Liver	56.2 gms	(Y) N	1	
Spleen		Y N		
Kidney	L 4.5 R 4.1 C	(Y) N	1	
Adrenal	L R C	Y N		
		Y N		
		Y N		

PRESERVATIVE: 1) 4% BUFFERED PARAFORMALDEHYDE, 2) BOUINS, 3) ALCOHOL, 4) _____, 5) _____

Specimen Identification No. BC380306 MR

Catalog No. 081293 BC380306 MR

Site Name API-PC-KR

Day 12 Mo. 08 Year 93 Time of Collection 1550

Sex (M) F Genus ~~Zapus~~ Ondatra Species (Muskrat) Zibethicus

TL 547 mm Tail 206 mm HF 72 mm Ear 27 mm Wt. 839 gm

Collector M.L. Lyons Trap No. BC 38

Trap Type Stoploss Leghold Victor #1 Live (Dead)

REPRODUCTIVE DATA:

MALE- Testis: L _____ W _____ Wt. _____

Seminal Vesicles: *Minute* *Small* *Large* Epididymis: *Convoluted* *Not Conv.*

FEMALE- Embryos R _____ L _____ Crown Rump _____ *Saved* *Discarded*

Placental Scars R _____ L _____ Corpora Lutea R _____ L _____

Mammary Development: *Small* *Large* *Lactating* Ovary Wt. _____

Vagina: *Inactive* *Cornified* *Turgid* *Plugged*

Reproductive Stage: *Nulliparous* *Semiparous* *Multiparous*

Comments: _____

SPECIAL COLLECTIONS:

Ectoparasites: Y N _____ *SAVED* *DISCARDED*

Endoparasites: Y N _____ *SAVED* *DISCARDED*

Stomach Contents: Y N _____ *SAVED* *DISCARDED*

Other- _____ _____ *SAVED* *DISCARDED*

Other- _____ _____ *SAVED* *DISCARDED*

ORGAN	WEIGHTS	HISTO. SAVED	PRESERVATIVE (SEE BELOW)	ABNORMALITIES/ COMMENTS
Liver	30.9gm	(Y) N	1	
Spleen		Y N		
Kidney	L 2.2g R 2.0g C	(Y) N	1	
Adrenal	L R C	Y N		
		Y N		
		Y N		

PRESERVATIVE: 1) 4% BUFFERED PARAFORMALDEHYDE, 2) BOUINS, 3) ALCOHOL, 4) _____, 5) _____

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: ~~MINK [MUSTELIDAE VISON]~~ / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: BC210304MR CATALOG: 08129BC210304MR SITE: Bath Creek

DATE COLLECTED; SPECIES; See above SEX; M

TOTAL LENGTH; 511mm TAIL; 226mm HINDFOOT; 71mm [RIGHT] EAR; 24mm [RIGHT]

TOTAL BODY WEIGHT; 740 gm

TRAP TYPE; Leghold TRAP NUMBER; BC21 COLLECTOR; M.H.

EXTERNAL NOTES;

REPRODUCTIVE; Normal

PARASITES; SAVED?

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION;

PARASITES; Normal SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 38.4 g

LIVER SAMPLE WEIGHT; 0.3g

KIDNEY TOTAL WEIGHT

RIGHT KIDNEY; 2.1g

LEFT KIDNEY; 2.2g

KIDNEY SAMPLE WEIGHT; 0.8g

SPECIAL COMMENTS;

EAR MEASUREMENT; INTERIOR POINT OF TRAGUS TO EXTERIOR POINT OF APEX

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

8/12/93

Specimen Identification No. BC210304 UR

Catalog No. 081293 BC210304 UK

Site Name API-PC-KR

Day ~~12~~ 12 Mo. 08 Year 93 Time of Collection 1430

Sex (M) F Genus Ondatra Species Muskrat Ondatra zibethicus

TL 311 Tail 226 HF 71 Ear 24 Wt. 740 gm

Collector Mike Harris Trap No. BC21

Trap Type Stoploss Leghold Victor #1 Live (Dead)

REPRODUCTIVE DATA:

MALE- Testis: L _____ W _____ Wt. _____

Seminal Vesicles: *Minute* *Small* *Large* Epididymis: *Convoluted* *Not Conv.*

FEMALE- Embryos R _____ L _____ Crown Rump _____ *Saved* *Discarded*

Placental Scars R _____ L _____ Corpora Lutea R _____ L _____

Mammary Development: *Small* *Large* *Lactating* Ovary Wt. _____

Vagina: *Inactive* *Cornified* *Turgid* *Plugged*

Reproductive Stage: *Nulliparous* *Semiparous* *Multiparous*

Comments: _____

SPECIAL COLLECTIONS:

Ectoparasites: Y N _____ *SAVED* *DISCARDED*

Endoparasites: Y N _____ *SAVED* *DISCARDED*

Stomach Contents: Y N _____ *SAVED* *DISCARDED*

Other- _____ _____ *SAVED* *DISCARDED*

Other- _____ _____ *SAVED* *DISCARDED*

ORGAN	WEIGHTS	HISTO. SAVED	PRESERVATIVE (SEE BELOW)	ABNORMALITIES/ COMMENTS
Liver	32.4 g	(Y) N	1	
Spleen		Y N		
Kidney	L 2.2 R 2.1 g C	(Y) N	1	
Adrenal	L R C	Y N		
		Y N		
		Y N		

PRESERVATIVE: 1) 4% BUFFERED PARAFORMALDEHYDE, 2) BOUINS, 3) ALCOHOL, 4) _____, 5) _____

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: BG130303MR CATALOG: 120893BG0303MR SITE: BACKGROUND → K-RIVER

DATE COLLECTED; 12/8/93 SPECIES; MUSKRAT SEX; FEMALE

TOTAL LENGTH; 530mm TAIL; 230.5 mm HINDFOOT; ~~167~~ dcc 67 mm [RIGHT]

TOTAL BODY WEIGHT; 1441g

TRAP TYPE; 1.5 DOUBLE COIL TRAP NUMBER; BG13 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES; EPISTEAXIS

REPRODUCTIVE; —

PARASITES; SAVED?

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION; INACTIVE FEMALE MULTI-PARIS

PARASITES; NONE SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 49.9g

LIVER SAMPLE WEIGHT; 1) 0.6g 2) 0.4g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 3.2g

LEFT KIDNEY; 3.4g

KIDNEY SAMPLE WEIGHT; 1.2g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: BG27A03 OZMR CATALOG: 120893BG27A03 OZMR SITE: BACKGROUND - K-RIVER

DATE COLLECTED; 12/08/93 SPECIES; MUSKRAT SEX; FEMALE

TOTAL LENGTH; 515mm TAIL; 215mm HINDFOOT; 70mm [RIGHT]

TOTAL BODY WEIGHT; 1,180g

TRAP TYPE; 1.5 LONG SPRING TRAP NUMBER; BG-27A COLLECTOR; MIKE HARRIS

EXTERNAL NOTES; NORMAL

REPRODUCTIVE; FEMALE, NON-PARES (VIRGIN)

PARASITES; SAVED?

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION;

PARASITES; NONE NOTED SAVED?

OTHER ABNORMALITIES; NONE

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 52.1 g

LIVER SAMPLE WEIGHT; 1) 0.4g 2) 0.4g

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY; 2.7g

LEFT KIDNEY; 2.8 g

KIDNEY SAMPLE WEIGHT; 1.3g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: BG14 030304MR CATALOG: 120893BG14030 4MR SITE: BACKGROUND → K-RIVER

DATE COLLECTED; 12/8/93 SPECIES; MUSKRAT SEX; FEMALE

TOTAL LENGTH; 546mm TAIL; 230mm HINDFOOT; ~~47mm~~ 70mm [RIGHT]

TOTAL BODY WEIGHT; 1274g

TRAP TYPE; 1.5 DOUBLE TRAP NUMBER; BG14 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES; COIL LOWER LEFT INCISOR - fractured & sucking lice

REPRODUCTIVE;

PARASITES; SAVED? MICROSCOPE SLIDE

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION; FEMALE, NON-PAROUS (VIRGIN)

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 44.0g

LIVER SAMPLE WEIGHT; 1) 0.3g 2) 0.4g

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY; 2.6g

LEFT KIDNEY; 2.5g

KIDNEY SAMPLE WEIGHT; 1.1g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: BG210305MR CATALOG: 120893 BG210305MR SITE: BACKGROUND → K-RIVER

DATE COLLECTED; 12/8/93 SPECIES; MUSKRAT SEX; MALE

TOTAL LENGTH; 484 mm TAIL; 234 mm HINDFOOT; 64 mm [RIGHT]

TOTAL BODY WEIGHT; 691g

TRAP TYPE; 1.5 LONG COIL TRAP NUMBER; BG COLLECTOR; MIKE HARRIS

EXTERNAL NOTES; SUCKING LICE (TNTC), LEFT FRONT LEG IS BROKEN

REPRODUCTIVE;

PARASITES; SAVED? SEE BG140304MR

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION; YOUNG MALE,

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 27.7g

LIVER SAMPLE WEIGHT; 1) 0.4g 2) 0.4g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 2.0g

KIDNEY SAMPLE WEIGHT; 0.8g

LEFT KIDNEY; 2.2g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: BG370307 MR CATALOG: 12089386370307 MR SITE: BACKGROUND → K-RIVER

DATE COLLECTED: 12/8/93 SPECIES: MUSKRAT SEX: MALE (ADULT)

TOTAL LENGTH: 564 mm TAIL: 253 mm HINDFOOT: 71 mm [RIGHT]

TOTAL BODY WEIGHT: 1357g

TRAP TYPE: 1.5 LONG SPRING TRAP NUMBER: BG37 COLLECTOR: MIKE HARRIS

EXTERNAL NOTES: EPISTAXIS & SPLIT LOWER LIP

REPRODUCTIVE;

PARASITES: NONE SAVED?

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION: ADULT MALE

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT: 56.2g

LIVER SAMPLE WEIGHT: 1) 0.4g 2) 0.3g

KIDNEY TOTAL WEIGHT

RIGHT KIDNEY: 2.8g

LEFT KIDNEY: 2.9g

KIDNEY SAMPLE WEIGHT: 1.1g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: BG360306MR CATALOG: ~~120893~~ 120893BG360306MR SITE: BACKGROUND → K-RIVER

DATE COLLECTED; 12/8/93 SPECIES; MUSKRAT SEX; ~~MALE~~ 1CC MALE (ADULT)

TOTAL LENGTH; 550 mm TAIL; 290 mm HINDFOOT; 70 mm [RIGHT]

TOTAL BODY WEIGHT; 1186g

TRAP TYPE; 1.5 LONG SPRING TRAP NUMBER; BG36 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES; BROKE RIGHT FRONT LEG, ~4 DAY OLD LACERATION AT L-4 (15mm LONG) NOT A PUNCTURE WOUND

REPRODUCTIVE;

PARASITES; SAVED?

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION; ~~YOUNG MALE~~ 1CC ADULT MALE

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; ~~27.7g~~ 1CC 46.8g

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY; 2.8g

LEFT KIDNEY; 2.9g

LIVER SAMPLE WEIGHT; ~~1) 0.4g~~ 1) 0.5g ~~2) 0.4g~~ 2) 0.6g

KIDNEY SAMPLE WEIGHT; 1.3g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: BG540502MK CATALOG: 121093136540502 MK SITE: KALAMAZOO RIVER - PICKERELL SECTION

DATE COLLECTED; 12/10/93 SPECIES; MINK SEX; MALE

TOTAL LENGTH; 569mm TAIL; 190mm HINDFOOT; 29mm [RIGHT]

TOTAL BODY WEIGHT; 1,136g

TRAP TYPE; 1.5 DOUBLE COIL-FOOT HOLD TRAP NUMBER; BG-541.5DC COLLECTOR; MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; Sucking Lice TNTC (TOO NUMEROUS TO COUNT.) SAVED? YES

OTHER ABNORMALITIES; BROKEN LEFT FOOT, LEFT LOWER CANINE TIP BROKEN OFF.

INTERNAL NOTES; OK

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 50.6g

LIVER SAMPLE WEIGHT; Sample one 0.2g Sample two 0.4g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 4.9g

LEFT KIDNEY; 5.6g

KIDNEY SAMPLE WEIGHT; 1.9g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, ~~INC./PORTAGE CREEK/KALAMAZOO~~ RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / ~~MUSKRAT [ONDATRA ZIBETHICA]~~

SPECIMAN ID.: BG470401MK CATALOG: 120993BG470401MK SITE: Battle Creek Background

DATE COLLECTED: 12/9/93 SPECIES: Mink SEX: Male

TOTAL LENGTH: 460 mm TAIL: 87 mm HINDFOOT: 13 mm [RIGHT]

TOTAL BODY WEIGHT: 1252 gm

TRAP TYPE: 1½ Double Coil TRAP NUMBER: BG47 COLLECTOR: M Harris

EXTERNAL NOTES: Old Bobbed Tail / Leg Hold

REPRODUCTIVE;

PARASITES: Ticks (10) SAVED? Yes

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT: 70.4 gm

LIVER SAMPLE WEIGHT: A/ 2.3 gm
B/ 2.3 gm

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY: 5.0 gm
LEFT KIDNEY: 5.4 gm

KIDNEY SAMPLE WEIGHT: R. → 1.5 gm

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: BG610703MK CATALOG: 121393BG610703MK SITE: API-PC-KR

DATE COLLECTED; 12-13-93 SPECIES; Mink SEX; Male

TOTAL LENGTH; 566mm TAIL; 185 mm HINDFOOT; 24.5mm [RIGHT]

TOTAL BODY WEIGHT; 919 gms

TRAP TYPE; Conibear 110 TRAP NUMBER; BG61 COLLECTOR; Mike Harris

EXTERNAL NOTES; Normal

REPRODUCTIVE;

PARASITES; SAVED?

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 59.7 gms

LIVER SAMPLE WEIGHT; #1 ⇒ .3gms #2 ⇒ .5gms

KIDNEY TOTAL WEIGHT

RIGHT KIDNEY; 4.5 gms

LEFT KIDNEY; 5.2 gms

KIDNEY SAMPLE WEIGHT; 1.9gms

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID,: BG340804MK CATALOG: 121493BG340804MK SITE: API-PC-KR

DATE COLLECTED; 12-14-93 SPECIES; MINK SEX; Male

*TOTAL LENGTH; ~~540mm~~ 540mm (md) *TAIL; 172mm *HINDFOOT; 23mm [RIGHT]

TOTAL BODY WEIGHT; 1063g

TRAP TYPE; 1/2 Longold TRAP NUMBER; BG34 COLLECTOR; M. Harris

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; SAVED?

*OTHER ABNORMALITIES; Damaged upper incisor from trap. Worn lower incisor. Upper right canine and bilateral lower canines broken. Upper left canine missing. Lower incisors and others are old injuries

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

*OTHER ABNORMALITIES; fissures in liver, probably at time of death

HISTOPATH SAMPLES; *LIVER TOTAL WEIGHT; 49.7g *LIVER SAMPLE WEIGHT; .5g .3g

*KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 4.7g *KIDNEY SAMPLE WEIGHT; 2g

*LEFT KIDNEY; 4.9g

SPECIAL COMMENTS;

Data will be sent on 12-16-93 via phone or fax.

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

* denote (md) ~~obs~~ information taken by field collection team transcribed by processing team

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: Test Rat for Shipping Procedure CATALOG: SITE: AD1-PC-KR

DATE COLLECTED: 12-15-93 SPECIES: Muskrat SEX: Male

TOTAL LENGTH: 410 mm TAIL: 204 mm HINDFOOT; [RIGHT] 68 mm

TOTAL BODY WEIGHT: 695 gm

TRAP TYPE: #1 Leghold TRAP NUMBER: B669 COLLECTOR: M. Harris

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; SAVED?

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT: 26.7 gm

LIVER SAMPLE WEIGHT: #1 0.3
#2 0.3

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY: 1.4 gm

LEFT KIDNEY: 1.4 gm

KIDNEY SAMPLE WEIGHT; 0.5 gm

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: BG 471205MK CATALOG: 12 1793BG471205MK SITE: Background

DATE COLLECTED; 12/17/93 SPECIES; MINK SEX; male

TOTAL LENGTH; 648mm TAIL; 213 mm HINDFOOT; 28mm [RIGHT]

TOTAL BODY WEIGHT; 1483g

TRAP TYPE; 15 Double Coil leg Hold TRAP NUMBER; BG-47 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES; Ticks (2)

REPRODUCTIVE; Dentition Upper And Lower canines Broken Upper, incisors Damaged on Trap

PARASITES; Canine teeth looks like old injuries But not sure Chuck. SAVED? yes (Ticks)

Right Leg Fracture From trap

OTHER ABNORMALITIES; Upper Left 2 premolars missing - old injury

INTERNAL NOTES; OK

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES; LIVER TOTAL WEIGHT; 56.5g LIVER SAMPLE WEIGHT; 0.5g #1 0.4g #2

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 5.6gm KIDNEY SAMPLE WEIGHT; 2.3gm

LEFT KIDNEY; 6.3gm

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: OD120205MR CATALOG: ~~012794OD120205MR~~ 012794OD120205MR SITE: OTSEGO DAM - KALAMAZOO RIVER

DATE COLLECTED; 1/27/94 SPECIES; MUSKRAT SEX; MALE

TOTAL LENGTH; 610 mm TAIL; 260 mm HINDFOOT; 76 mm [RIGHT]

TOTAL BODY WEIGHT; 1264 g

TRAP TYPE; 110-CONIBEAR TRAP NUMBER; OD-12 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE; ~~MALE~~

PARASITES; SUCKING MITES (TNTC) SAVED?

OTHER ABNORMALITIES; - bite marks along top-side
- puncture wound over left lumbar region
- laceration over right lumbar region (≤ 5mm long)

INTERNAL NOTES; - skin nodule over left pelvic region

REPRODUCTION; MALE

PARASITES; SAVED?

OTHER ABNORMALITIES; ~~EMPHYSEMA ALL LOBES (CLUE)~~ EMPHYSEMA ALL LUNG LOBES, TAPEWORM CYSTS (numerous)

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; ~~59.9~~ 59.9 g (this includes the tapeworms)

LIVER SAMPLE WEIGHT; ~~0.3~~ 0.3 g

KIDNEY TOTAL WEIGHT

RIGHT KIDNEY; 3.1 g

LEFT KIDNEY; 3.2 g

KIDNEY SAMPLE WEIGHT; 1.0g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

REAC# 012794-981

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: 0D01 0206MR CATALOG: 0127940D01 0206MR SITE: OTSEGO DAM ~~RIVER~~ - see KALAMAZOO RIVER

DATE COLLECTED; 1/27/94 SPECIES; MUSKRAT SEX; FEMALE

TOTAL LENGTH; 530 mm TAIL; 230.5 mm HINDFOOT; 74 mm [RIGHT]

TOTAL BODY WEIGHT; 1037 g

TRAP TYPE; 1.5 DOUBLE COIL - FOOT HOLD TRAP NUMBER; OD-01 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; SUCKING MITES (just a few) SAVED? NO

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES; - broken left hindleg (from trap) emphysema in half of lung lobes

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 34.9 g

LIVER SAMPLE WEIGHT; 0.3 g 0.2 g

KIDNEY TOTAL WEIGHT

RIGHT KIDNEY; 3.0 g

LEFT KIDNEY; 3.0 g

KIDNEY SAMPLE WEIGHT; 1.3 g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: OD140204MR CATALOG: 0127940D140204MR SITE: OTSEGO DAM KALAMAZOO RIVER

DATE COLLECTED; 1/27/94 SPECIES; MUSKRAT SEX; MALE

TOTAL LENGTH; 575 mm TAIL; 250 mm HINDFOOT; 73mm [RIGHT] EAR; [RIGHT]

TOTAL BODY WEIGHT; 1496 g

TRAP TYPE; 1.5 DOUBLE COIL - FOOTHOLD TRAP NUMBER; OD-14 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; SUCKING MITES (TNTC) SAVED?

OTHER ABNORMALITIES;
~~SET~~ BRUISING ON LEFT HIND LEG (FROM TRAP), LOWER LIP IS BRUISED (PROBABLY FROM CUTTINGS ON TRAP).

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES; Emphysema all lung lobes

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 59.1 g

LIVER SAMPLE WEIGHT; 0.5 g. 0.2 g

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY; 5.1 g

LEFT KIDNEY; 4.6 g

KIDNEY SAMPLE WEIGHT; 2.0 g

SPECIAL COMMENTS;

EAR MEASUREMENT; INTERIOR POINT OF TRAGUS TO EXTERIOR POINT OF APEX

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / (MUSKRAT) [ONDATRA ZIBETHICA]

SPECIMAN ID.: OD170101MR

CATALOG: C126940D1701MR

SITE: OTSEGO DAM - KALAMAZOO RIVER

DATE COLLECTED; 1/26/94

SPECIES; MUSKRAT

SEX; FEMALE

TOTAL LENGTH; 600mm

TAIL; 248mm

HINDFOOT; 79mm [RIGHT]

TOTAL BODY WEIGHT; 1475g

TRAP TYPE; 1.5 ~~DOUBLE~~ LONGSPRING ~~COIL~~ DEE

TRAP NUMBER; OD-17

COLLECTOR; MIKE HARRIS

EXTERNAL NOTES; C

REPRODUCTIVE;

PARASITES;

SAVED?

OTHER ABNORMALITIES;
CUT ON RIGHT FRONT & RIGHT REAR IS ALSO CUT & BRUISED

INTERNAL NOTES;

REPRODUCTION;

PARASITES;

SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 61.5g

LIVER SAMPLE WEIGHT; 0.7g
0.8g

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY; 3.2g

LEFT KIDNEY; 3.5g

KIDNEY SAMPLE WEIGHT; 1.4g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / (MUSKRAT) [ONDATRA ZIBETHICA]

SPECIMAN ID.: OD040103MR

CATALOG: 0126940D040103MR

SITE: OTSEGO DAM - KALAMAZOO RIVER

DATE COLLECTED; 1/26/94 SPECIES; MUSKRAT SEX; MALE

TOTAL LENGTH; 593 mm TAIL; 298 mm HINDFOOT; 78 mm [RIGHT]

TOTAL BODY WEIGHT; 1240g

TRAP TYPE; 1.5 DOUBLE COIL TRAP NUMBER; OD-04 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; (SAVED?)

OTHER ABNORMALITIES; MITES (TNTC)

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES; ~~MITES (TNTC)~~ ICC

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 42.3g

LIVER SAMPLE WEIGHT; 0.1g 0.7g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 3.0g

LEFT KIDNEY; 3.1g

KIDNEY SAMPLE WEIGHT; 1.4g

SPECIAL COMMENTS;

Clipped fingers

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: OD02010ZMR CATALOG: 01294020ZMR SITE: OTSEGO DAM - KALAMAZOO RIVER

DATE COLLECTED; 1/26/94 SPECIES; MUSKRAT SEX;

TOTAL LENGTH; 460 mm TAIL; 128 mm HINDFOOT; 74 mm [RIGHT]

TOTAL BODY WEIGHT; 1314 g

TRAP TYPE; 1.5 DOUBLE COIL TRAP NUMBER; OD-02 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; SAVED?

OTHER ABNORMALITIES; MITE(INTC) MISSING 1/2 TAIL OLD INJURY; CUT ON LEFT REAR FOOT

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES; ~~MITE(INTC)~~ DCC POSSIBLE EMPHYSEMA INCLUDES 2- CYSTS IN LIVER, ONE LIVER SCAR, TAENIA CYSTS

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 50.5g

LIVER SAMPLE WEIGHT; 0.2g 0.2g

CYST SAMPLE 1.3g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 4.7g

LEFT KIDNEY; 4.6g

KIDNEY SAMPLE WEIGHT; 2.0g

SPECIAL COMMENTS;

Pinned frozen

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: TB16020IMR CATALOG: 021594TB16020IMR SITE: TROLLBRIDGE - KALAMAZOO RIVER

DATE COLLECTED; 2-15-94 SPECIES; MUSKRAT SEX; MALE

TOTAL LENGTH; ~~416~~ 551 mm TAIL; 244 mm HINDFOOT; 71 mm [RIGHT]

TOTAL BODY WEIGHT; 1163 g

TRAP TYPE; 1.5 DOUBLE COIL FOOT HOLD TRAP NUMBER; TB-16 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; MITES - TNTC SAVED? YES ALCOHOL-VIAL

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES; LIVER TOTAL WEIGHT; 40.4 g LIVER SAMPLE WEIGHT; 1) 0.3 g 2) 0.4 g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 3.1 g KIDNEY SAMPLE WEIGHT; 0.9 g

LEFT KIDNEY; 3.2 g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: TB06020ZMR CATALOG: 021594TB06020ZMR SITE: TROLLBRIDGE - KALAMAZOO RIVER

DATE COLLECTED; 2-15-94 SPECIES; MUSKRAT SEX; FEMALE

TOTAL LENGTH; 545 mm TAIL; 225 mm HINDFOOT; 69 mm [RIGHT]

TOTAL BODY WEIGHT; 990 g

TRAP TYPE; 110 CONIBEAR TRAP NUMBER; TB06 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; mite = TNTC SAVED? YES alcohol vial

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION; ADULT-PARAS (FEMALE)

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 29.3

LIVER SAMPLE WEIGHT; 1) 0.4 g 2) 0.4 g

KIDNEY TOTAL WEIGHT

RIGHT KIDNEY; 2.4 g

LEFT KIDNEY; 2.4 g

KIDNEY SAMPLE WEIGHT; 1.2 g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [~~MUSTELIDAE~~ Mustela VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: TB320303MR CATALOG: 021694TB320303MR SITE: TROLLBRIDGE - KALAMAZOO RIVER

DATE COLLECTED: 2-16-94 SPECIES: muskrat SEX: Female

TOTAL LENGTH: 511mm TAIL: 252 mm HINDFOOT: 72 mm [RIGHT]

TOTAL BODY WEIGHT: 800g

TRAP TYPE: Double 6x1 TRAP NUMBER: TB-32 COLLECTOR: MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE; ~~Single Parous~~ RDF

PARASITES; TNC-5 SAVED? yes

OTHER ABNORMALITIES;

INTERNAL NOTES; Bruising right rear foot
Puncture - right foot, middle toe (2mm - 1cm depth)

REPRODUCTION; Single Parous

PARASITES; SAVED?

OTHER ABNORMALITIES;

Empty upper G.I.

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 53.1g

LIVER SAMPLE WEIGHT 0.4g 0.4g

KIDNEY TOTAL WEIGHT

RIGHT KIDNEY; 3.0g

LEFT KIDNEY; 2.8g

KIDNEY SAMPLE WEIGHT; 1.6g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [~~MUSTELIDAE~~ Mustela VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: TB110301MK CATALOG: 021694TB110301MK SITE: TROUSBRIDGE - KALAMAZOO RIVER

DATE COLLECTED: 2-16-94 SPECIES: MINK SEX: Female

TOTAL LENGTH: 512mm TAIL: 111mm HINDFOOT: 26mm [RIGHT]

TOTAL BODY WEIGHT: 686g

TRAP TYPE: 110 CONIBEAR TRAP NUMBER: TB-11 COLLECTOR: MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; TICKS (x10), COAT HAS DANDRUFF SAVED? YES - in vials w/ alcohol

OTHER ABNORMALITIES; Both lower canine tips chip - upper right canine chipped.

INTERNAL NOTES; Suspect ~~lungs~~ liver

REPRODUCTION; Ovaries macroscopic

PARASITES; ~~None~~ Cestodes SAVED? ~~No~~ Yes

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 39.6g

LIVER SAMPLE WEIGHT; 0.4g, 0.2g

KIDNEY TOTAL WEIGHT

RIGHT KIDNEY; 2.7g

LEFT KIDNEY; 2.9g

KIDNEY SAMPLE WEIGHT; 1.0g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [~~MUSTELIDAE~~ Mustela VISON] / (MUSKRAT ~~[~~ONDATRA ZIBETHICA]

SPECIMAN ID.: TB25030SMR CATALOG: 021694TB25030SMR SITE: TROWBRIDGE-KALAMAZOO R

DATE COLLECTED; 2-16-94 SPECIES; MUSKRAT SEX; young male

TOTAL LENGTH; ~~513~~ 513 mm TAIL; 225mm HINDFOOT; 68 mm [RIGHT]

TOTAL BODY WEIGHT; 894g

TRAP TYPE; LS DOUBLE COIL TRAP NUMBER; TB-25 COLLECTOR; MIKE HARRIS
(FOOT HOLD)

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; MITES (TNTC) SAVED? yes, in vial

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 45.1g

LIVER SAMPLE WEIGHT; .4g
.3g

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY; 3.9g

LEFT KIDNEY; 3.6g

KIDNEY SAMPLE WEIGHT; 1.2g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [~~MUSTELIDAE~~ Mustela VISON] (MUSKRAT) [ONDATRA ZIBETHICA]

SPECIMAN ID.: TB290304mR CATALOG: 021694TB290304mR SITE: TROWBRIDGE-KALAMAZOO RIVER

DATE COLLECTED: 2-16-94 SPECIES: MUSKRAT SEX: Male

TOTAL LENGTH: ~~351~~ 311 mm TAIL: 213mm HINDFOOT: 65 mm [RIGHT]

TOTAL BODY WEIGHT: 909 g

TRAP TYPE: 110 Conibear TRAP NUMBER: TB29 COLLECTOR: MIKE HARRIS

EXTERNAL NOTES:

REPRODUCTIVE:

PARASITES: Mite (TNC) SAVED? yes

OTHER ABNORMALITIES: old laceration - caudal ½ of tail (4 mm length)

INTERNAL NOTES:

REPRODUCTION:

PARASITES: SAVED?

OTHER ABNORMALITIES:

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT: 42.5g

LIVER SAMPLE WEIGHT: .5g .4g

KIDNEY TOTAL WEIGHT

RIGHT KIDNEY: 3.1g

LEFT KIDNEY: 3.1g

KIDNEY SAMPLE WEIGHT: 1.4g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: (MINK) [MUSTELIDAE VISON] / ~~MUSKRAT~~ [ONDATRA ZIBETHICA]

SPECIMAN ID.: TB110402MK CATALOG: 02794TB110402MK SITE: TROWBRIDGE

DATE COLLECTED: 2/17/94 SPECIES: ~~MUSKRAT~~ MINK SEX: Male

TOTAL LENGTH: 615 TAIL: 240 HINDFOOT: 63mm [RIGHT]

TOTAL BODY WEIGHT: 1406g

TRAP TYPE: ~~H.B. 4"x5"x12"~~ 15 Double Coil TRAP NUMBER: TB-16 COLLECTOR: MIKE HARRIS

EXTERNAL NOTES: Footpad

REPRODUCTIVE;

PARASITES: ~~Flea~~ ROF SAVED?

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES; LIVER TOTAL WEIGHT; 75.8g LIVER SAMPLE WEIGHT; 1) 0.4g 2) 0.4g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 5.0g KIDNEY SAMPLE WEIGHT; 2.6g

LEFT KIDNEY; 5.8g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: ~~MINK~~ [MUSTELIDAE VISON] (MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: TB160406MR CATALOG# 21794 TB160406MR SITE: TROWBRIDGE

DATE COLLECTED: 2/17/94 SPECIES: ~~MINK~~ MUSKRAT SEX: ~~TROWBRIDGE~~ male

TOTAL LENGTH: 560 mm TAIL: 240 mm HINDFOOT: 70 mm [RIGHT]

TOTAL BODY WEIGHT: 1400g 1100gm. bear

TRAP TYPE: ~~LC~~ Foot Hold TRAP NUMBER: ~~TB-11~~ TB-11

COLLECTOR: MIKE HARRIS

EXTERNAL NOTES:

REPRODUCTIVE:

PARASITES: TNC SAVED? yes

OTHER ABNORMALITIES:

INTERNAL NOTES:

REPRODUCTION:

PARASITES: SAVED? A portion of Lung saved.

OTHER ABNORMALITIES: Emphysema?

HISTOPATH SAMPLES:

LIVER TOTAL WEIGHT: 58.1g

LIVER SAMPLE WEIGHT: 1) 0.4g 2) 0.3g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY: 5.2g

LEFT KIDNEY: 5.1g

KIDNEY SAMPLE WEIGHT: 2.2g

SPECIAL COMMENTS:

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELA VISON] / MUSKRAT [ONDATRA ZIBETHICA]
SPECIMAN ID.: PD060201MR
CATALOG: 031494 PD060201MR
SITE: PLAINWELL DAM

DATE COLLECTED; 3-14-94 SPECIES; MUSKRAT SEX; MALE

TOTAL LENGTH; 562mm TAIL; 248mm HINDFOOT; 81mm [RIGHT]

TOTAL BODY WEIGHT; 1220g

TRAP TYPE; 1.5 LONG SPRING FOOT HOLD TRAP NUMBER; PD-06 COLLECTOR; MICHAEL HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; MITES - TNTC SAVED? yes, in alcohol

OTHER ABNORMALITIES; left rear medial toe is missing (old trap injury) normal - left rear foot ~~bad~~ due to trap

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 54g

LIVER SAMPLE WEIGHT; 1) 0.7g 2) 0.5g

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY; 4.2g

LEFT KIDNEY; 4.4g

KIDNEY SAMPLE WEIGHT; 1.9g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELA VISON] / (MUSKRAT) [ONDATRA ZIBETHICA]
SPECIMAN ID.: PD22020ZMR CATALOG: 031494PD22020ZMR SITE: PLAINWELL DAM

DATE COLLECTED; 3-14-94 SPECIES; MUSKRAT SEX; FEMALE

TOTAL LENGTH; 512mm TAIL; 207mm HINDFOOT; 69mm [RIGHT]

TOTAL BODY WEIGHT; 904g

TRAP TYPE; 1.5 DOUBLE COIL FOOT HOLD TRAP NUMBER; PD-22 COLLECTOR; MICHAEL HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; MITES- TNTC SAVED? yes, in alcohol

OTHER ABNORMALITIES; left front leg fracture due to trap

INTERNAL NOTES;

REPRODUCTION; left ovary active two follicles
right ovary active three follicles

PARASITES; appropriate worms SAVED? yes (in cyst (0.5g)

OTHER ABNORMALITIES; liver-hepatic cyst (2)
abnormal tissue located near left angle of jaw (20x15x5mm)
unusually large tissue
*REQUEST HISTO ID. *

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 32g

LIVER SAMPLE WEIGHT; 1) 0.5 g
2) 0.3 g
3) 0.3 g

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY; 3.0g

LEFT KIDNEY; 2.9g

KIDNEY SAMPLE WEIGHT; 0.9g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELA VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: PD070204MR CATALOG: 031494 PD070204MR SITE: PLAINWELL DAM

DATE COLLECTED; 3-14-94 SPECIES; MUSKRAT SEX; MALE

TOTAL LENGTH; 446 mm TAIL; 204 mm HINDFOOT; 69 mm [RIGHT]

TOTAL BODY WEIGHT; 909g

TRAP TYPE; 110 CONIBEAR TRAP NUMBER; PD-07 COLLECTOR; MICHAEL HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; SAVED?

OTHER ABNORMALITIES; EPISTAXIS

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 29.6g

LIVER SAMPLE WEIGHT; 0.4g 0.3g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 2.9g

LEFT KIDNEY; 2.9g

KIDNEY SAMPLE WEIGHT; 1.2g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELA VISON] / (MUSKRAT) [ONDATRA ZIBETHICA]

SPECIMAN ID.: PD110206MR CATALOG: 031494PD110206MR SITE: PLAINWELL DAM

DATE COLLECTED; 3-14-94 SPECIES; MUSKRAT SEX; MALE

TOTAL LENGTH; 550 mm TAIL; 225 mm HINDFOOT; 73 mm [RIGHT]

TOTAL BODY WEIGHT; 1306g

TRAP TYPE; 1.5 DOUBLE COIL FOOT HOLD TRAP NUMBER; PD-11 COLLECTOR; MICHAEL HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; MITES - TNTC SAVED? yes, in alcohol

OTHER ABNORMALITIES; ~~liver~~

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED? yes

OTHER ABNORMALITIES; liver - several lesions (discoloration)

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 42.7g

LIVER SAMPLE WEIGHT; 1) 0.2g 2) 0.4g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 4.9g

KIDNEY SAMPLE WEIGHT; 1.8g

LEFT KIDNEY; 5.2g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELA VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: PD180203MR CATALOG: 031494PD180203MR SITE: PLAINWELL DAM

DATE COLLECTED; 3-14-94 SPECIES; MUSKRAT SEX; FEMALE

TOTAL LENGTH; 494mm TAIL; 195 mm HINDFOOT; 73 mm [RIGHT]

TOTAL BODY WEIGHT; 1099g

TRAP TYPE; 1.5 LONG SPRING FOOT HOLD TRAP NUMBER; PD-18 COLLECTOR; MICHAEL HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; SAVED?

OTHER ABNORMALITIES; old injury to tail - missing part of it

INTERNAL NOTES;

REPRODUCTION; left ovary-follicles TNTC active
right ovary follicles TNTC
uterus appropriate

PARASITES; hepatic cysts ~~isolated~~ (three) SAVED? YES

OTHER ABNORMALITIES; discoloration - all lesions
3 - cysts tapeworm in origin

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 38.0g

LIVER SAMPLE WEIGHT; 1) 0.4g 2) 0.8g

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY; 3.1g

LEFT KIDNEY; 3.2g

KIDNEY SAMPLE WEIGHT; 1.3g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELA VISON] (MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: PD240205MR CATALOG: 031494PD240205MR SITE: PLAINWELL DAM

DATE COLLECTED; 3-14-94 SPECIES; MUSKRAT SEX; MALE

TOTAL LENGTH; 441 mm TAIL; 203 mm HINDFOOT; 68 mm [RIGHT]

TOTAL BODY WEIGHT; 1060 g

TRAP TYPE; 1.5 LONGSPRING FOOT HOLD TRAP NUMBER; PD-24 COLLECTOR; MICHAEL HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; MITES - TNTC SAVED? yes, in alcohol

OTHER ABNORMALITIES; left front leg - trap injury

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED? lesion saved

OTHER ABNORMALITIES; liver - discoloration

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 32.6

LIVER SAMPLE WEIGHT; 1) 0.4 g 2) 0.3 g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 4.2 g

KIDNEY SAMPLE WEIGHT; 1.9 g

LEFT KIDNEY; 3.9 g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELA VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: PD360701MK CATALOG: 031994.PD360701MK SITE: PLAINWELL DAM KALAMAZOO RIVER

DATE COLLECTED; 3-19-94 SPECIES; MINK SEX; FEMALE

TOTAL LENGTH; 509 mm TAIL; 172 mm HINDFOOT; [RIGHT] 19 mm

TOTAL BODY WEIGHT; 667 g

TRAP TYPE; 1.5 LONGSPRING FOOT HOLD TRAP NUMBER; PD-36 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; TICKS (~~25~~) ~~[illegible]~~ 20 CJM SAVED? yes in ALCOHOL

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION; OVARIES INACTIVE

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 37.1 g

LIVER SAMPLE WEIGHT; 1) 0.3 g 2) 0.3 g

KIDNEY TOTAL WEIGHT

RIGHT KIDNEY; 3.3 g

LEFT KIDNEY; 3.3 g

KIDNEY SAMPLE WEIGHT; 1.1 g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELA VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: AD300104MR

CATALOG: 033094AD300104MR

SITE: ALLEGAN DAM

DATE COLLECTED; 3-30-94 SPECIES; MUSKRAT SEX; MALE

TOTAL LENGTH; 544 mm TAIL; 229 mm HINDFOOT; [RIGHT] 68 mm

TOTAL BODY WEIGHT; 1305 g

TRAP TYPE; 1.5 DOUBLE COIL FOOT HOLD TRAP NUMBER; AD-30 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; MITES-TNTC SAVED? yes, in alcohol

OTHER ABNORMALITIES; FACE - SEVERELY LACERATED (MUTILATED), PROBABLE CAUSE IS ANIMAL ATTACK. RIGHT FRONT LEG DAMAGED DUE TO FOOTHOLD TRAP

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED? yes

OTHER ABNORMALITIES; LIVER - SCAR TRACKS (OCCASIONAL)

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 66.7g

LIVER SAMPLE WEIGHT; 1) 0.8 g 2) 0.6 g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 4.6g

LEFT KIDNEY; 4.7 g

KIDNEY SAMPLE WEIGHT; 2.2g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELA VISON] / MUSKRAT [ONDATRA ZIBETHICA]
SPECIMAN ID.: AO24O101MR CATALOG: 033094 AO24O101MR SITE: ALLEGAN DAM

DATE COLLECTED; 3-30-94 SPECIES; MUSKRAT SEX; FEMALE

TOTAL LENGTH; 512 mm TAIL; 213 mm HINDFOOT; 70 mm [RIGHT]

TOTAL BODY WEIGHT; 1018 g

TRAP TYPE; 1.5 DOUBLE COIL FOOT HOLD TRAP NUMBER; AO-24 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; MITES-TNTC SAVED? yes, in alcohol

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES; BOTH OVARIES - TOO NUMEROUS TO COUNT FOLLICLES IN PROPER STAGE PROPER DEVELOPMENT

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 57.4 g

LIVER SAMPLE WEIGHT; 1) 0.6 g 2) 0.5 g

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY; 3.6 g

LEFT KIDNEY; 3.7 g

KIDNEY SAMPLE WEIGHT; 1.5 g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELA VISON] / MUSKRAT [ONDATRA ZIBETHICA]
SPECIMAN ID.: AD090103MR CATALOG: 033094AD090103MR SITE: ALLEGAN DAM

DATE COLLECTED; 3-30-94 SPECIES; MUSKRAT SEX; MALE

TOTAL LENGTH; 549mm TAIL; 230mm HINDFOOT; 67 mm [RIGHT]

TOTAL BODY WEIGHT; 1410g

TRAP TYPE; 1.5 DOUBLE COIL FOOTHOLD TRAP NUMBER; AD-09 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; MITES-TNTC SAVED? yes, in alcohol

OTHER ABNORMALITIES; LEFT REAR FOOT DAMAGED DUE TO FOOTHOLD TR

INTERNAL NOTES;

REPRODUCTION; MALE-INTACT

PARASITES; SAVED?

OTHER ABNORMALITIES;

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 58.0g

LIVER SAMPLE WEIGHT; 1) 0.4 g
2) 0.3 g

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY; 4.9g

LEFT KIDNEY; 4.8g

KIDNEY SAMPLE WEIGHT; 2.6g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELA VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: AD160102MR CATALOG: 033094AD160102MR SITE: ALLEGAN DAM

DATE COLLECTED; 3-30-94 SPECIES; MUSKRAT SEX;

TOTAL LENGTH; 448mm TAIL; 239 mm HINDFOOT; 68mm [RIGHT]

TOTAL BODY WEIGHT; 1241g

TRAP TYPE; 1.5 DOUBLE COIL FOOT HOLD TRAP NUMBER; AD-16 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; MITES - TNTC SAVED? yes, in alcohol

OTHER ABNORMALITIES; RIGHT REAR FOOT TRAUMATIZED DUE TO TRAP?

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES; CAUSE OF DEATH IS LACERATED LIVER, EVIDENCE OF BLOOD CLOT

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 45.7g

LIVER SAMPLE WEIGHT; 1) 0.3 g 2) 0.4 g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 3.8g

LEFT KIDNEY; 3.4g

KIDNEY SAMPLE WEIGHT; 1.8g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELA VISON] (MUSKRAT) [ONDATRA ZIBETHICA]
SPECIMAN ID.: AD500405MR2 CATALOG: 040494 AD500405MR SITE: ALLEGAN DAM

DATE COLLECTED; 4-4-94 SPECIES; MUSKRAT SEX; MALE

TOTAL LENGTH; 531 mm TAIL; 217 mm HINDFOOT; [RIGHT] 71 mm

TOTAL BODY WEIGHT; 1201 g

TRAP TYPE; 1.5 DOUBLECOIL FOOTHOLD TRAP NUMBER; AD-50 COLLECTOR; MIKE HARELS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; MITES (TNTC) SAVED? yes, in alcohol

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED? yes, in formalin

OTHER ABNORMALITIES; LIVER - SCAR TISSUE (TNTC)

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; (00.1g

LIVER SAMPLE WEIGHT; 1) 0.3 g 2) 0.7 g

KIDNEY TOTAL WEIGHT

RIGHT KIDNEY; 5.7g

LEFT KIDNEY; 5.5 g

KIDNEY SAMPLE WEIGHT; 1.8g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELA VISON] (MUSKRAT) [ONDATRA ZIBETHICA]
SPECIMAN ID.: AD60050606MR
CATALOG: 040594AD60050606MR
SITE: ALLEGAN DAM

DATE COLLECTED: 4-5-94 SPECIES: MUSKRAT SEX:

TOTAL LENGTH: 533mm TAIL: 212 mm HINDFOOT: 71 mm [RIGHT]

TOTAL BODY WEIGHT: 1369 g

TRAP TYPE: 1.5 DOUBLE COIL FOOTHOLD TRAP NUMBER: AD-60 COLLECTOR: MICHAEL HARRIS

EXTERNAL NOTES:

REPRODUCTIVE:

PARASITES: MITES (TNTC) SAVED? yes in alcohol

OTHER ABNORMALITIES: LEFT REAR LEG BROKEN FROM LEG HOLD TRAP

INTERNAL NOTES:

REPRODUCTION:

PARASITES: SAVED? yes, in formalin

OTHER ABNORMALITIES: LIVER, SCARRED

HISTOPATH SAMPLES:

LIVER TOTAL WEIGHT: 51.6 g

LIVER SAMPLE WEIGHT: 1) 0.6 g
2) 0.3 g

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY: 4.9 g

LEFT KIDNEY: 4.7 g

KIDNEY SAMPLE WEIGHT: 1.7 g

SPECIAL COMMENTS:

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELA VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: AD-160501MK CATALOG: 040794AD160501MK SITE:

DATE COLLECTED; 4-7-94 SPECIES; MINK SEX; MALE

TOTAL LENGTH; 685mm TAIL; 260 m HINDFOOT; 63mm [RIGHT]

TOTAL BODY WEIGHT; ~~1219~~ 1530g

TRAP TYPE; 1.5 DOUBLE COIL FOOTHOLD TRAP NUMBER; AD-16 COLLECTOR; MICHITEC HH2025

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; CLEAN SAVED?

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES; CLEAN

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 62.5 g

LIVER SAMPLE WEIGHT; 1) 0.8 g 2) 0.3 g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; 5.5 g

LEFT KIDNEY; 5.5 g

KIDNEY SAMPLE WEIGHT; 1.4 g

SPECIAL COMMENTS;

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELA VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: A006021OMK CATALOG: 042694A006021OMK SITE: KALAMAZOO RIVER-ALLEGAN DPM

DATE COLLECTED; 4-26-94 SPECIES; MINK SEX; MALE

TOTAL LENGTH; 625 mm TAIL; 214 mm HINDFOOT; 22 mm [RIGHT]

TOTAL BODY WEIGHT; 1172 g

TRAP TYPE; 1.5 DOUBLE COIL FOOT HOLD TRAP NUMBER; A0-06 COLLECTOR; MIKE HARRIS

EXTERNAL NOTES;

REPRODUCTIVE;

PARASITES; LICE (NITC), appears to be biting lice TICKS (4) SAVED? yes, in alcohol

OTHER ABNORMALITIES; lower left canine & upper right canines are broke off due to trap

LEFT REAR LEG BRUISED FROM TRAP)

INTERNAL NOTES;

REPRODUCTION;

PARASITES; SAVED?

OTHER ABNORMALITIES; multiple FOCAL EROSIONS located on cortex of kidneys - bilateral.

- NO BLOOD CLOTS LOCATED IN HEART CHAMBERS, LACK OF PROPER AMOUNT OF POST MORTEM CLOTS, SUSPECT BLEEDING DISORDER.

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 68.3 g

LIVER SAMPLE WEIGHT; 1) 0.3 g 2) 0.3 g

KIDNEY TOTAL WEIGHT

RIGHT KIDNEY; 4.6 g

LEFT KIDNEY; 4.9 g

KIDNEY SAMPLE WEIGHT; ~~2.4~~ 2.2 g

SPECIAL COMMENTS; PLEASE LOOK FOR EVIDENCE OF ALEUTIAN MINK DISEASE, CANINE DISTEMPER (ENDEMIC IN LOCAL RACCOONS)

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / MUSKRAT [ONDATRA ZIBETHICA]

SPECIMAN ID.: BC 380203MR CATALOG: 081193 BC 380203 mr SITE: Battle Creek Control

DATE COLLECTED; 8/11/93 SPECIES; Muskrat SEX; M (immature)

TOTAL LENGTH; 515 mm TAIL; 203 mm HINDFOOT; 70mm [RIGHT] EAR; 13 mm [RIGHT]

TOTAL BODY WEIGHT; 892 gm

TRAP TYPE; Leg Hold TRAP NUMBER; BC38 COLLECTOR; M. H.

EXTERNAL NOTES; Food in mouth

REPRODUCTIVE;

PARASITES; SAVED?

OTHER ABNORMALITIES;

INTERNAL NOTES;

REPRODUCTION; immature

PARASITES; tape-worm life cycle SAVED?

OTHER ABNORMALITIES; white modeling on both kidneys 3 focal lesions, spherical in design, smallest is 5mm, 10mm (med.), 3mm largest diameter

HISTOPATH SAMPLES; LIVER TOTAL WEIGHT; 38.4g LIVER SAMPLE WEIGHT; 0.7g * 0.2g

KIDNEY TOTAL WEIGHT RIGHT KIDNEY; ~~5.0g~~ mk 4.5g

KIDNEY SAMPLE WEIGHT; 1.9g

LEFT KIDNEY; 4.7g

SPECIAL COMMENTS;

Sample with lesion

EAR MEASUREMENT; INTERIOR POINT OF TRAGUS TO EXTERIOR POINT OF APEX

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

8/11/93

Specimen Identification No. BC380203 MR

Catalog No. 081193BC380203MR

Site Name API-PC-KR

Day 11 Mo. 08 Year 93 Time of Collection 1615

Sex (M) F Genus Ondatra Species (Muskrat) 2 others

TL 315 mm Tail 203 mm HF 71 mm Ear 13 mm Wt. 692 gm

Collector Mike Harris Trap No. BC38

Trap Type Stoploss Leghold Victor #1 Live (Dead)

REPRODUCTIVE DATA:

MALE- Testis: L _____ W _____ Wt. _____

Seminal Vesicles: *Minute* *Small* *Large* Epididymis: *Convoluted* *Not Conv.*

FEMALE- Embryos R _____ L _____ Crown Rump _____ *Saved* *Discarded*

Placental Scars R _____ L _____ Corpora Lutea R _____ L _____

Mammary Development: *Small* *Large* *Lactating* Ovary Wt. _____

Vagina: *Inactive* *Cornified* *Turgid* *Plugged*

Reproductive Stage: *Nulliparous* *Semiparous* *Multiparous*

Comments: _____

SPECIAL COLLECTIONS:

Ectoparasites: Y N _____ *SAVED* *DISCARDED*

Endoparasites: Y N _____ *SAVED* *DISCARDED*

Stomach Contents: Y N _____ *SAVED* *DISCARDED*

Other- _____ _____ *SAVED* *DISCARDED*

Other- _____ _____ *SAVED* *DISCARDED*

ORGAN	WEIGHTS	HISTO. SAVED	PRESERVATIVE (SEE BELOW)	ABNORMALITIES/ COMMENTS
Liver	38 cg	Y N	1	
Spleen		Y N		
Kidney	L 47 R 48 C	Y N	1	
Adrenal	L R C	Y N		
		Y N		
		Y N		

PRESERVATIVE: 1) 4% BUFFERED PARAFORMALDEHYDE, 2) BOUINS, 3) ALCOHOL, 4) _____, 5) _____

ALLIED PAPER, INC./PORTAGE CREEK/KALAMAZOO RIVER SUPERFUND SITE

BIOTA STUDY: MINK [MUSTELIDAE VISON] / (MUSKRAT [ONDATRA ZIBETHICA])

SPECIMAN ID.: BC270305MR CATALOG: 0812938C270305MR SITE: Battle Creek

DATE COLLECTED; 08/12/93 SPECIES; see above SEX; M

TOTAL LENGTH; 480mm TAIL; 189mm HINDFOOT; 69mm [RIGHT] EAR; 25mm [RIGHT]

TOTAL BODY WEIGHT; 707g

TRAP TYPE; Leghold TRAP NUMBER; BC27 COLLECTOR; M.H.

EXTERNAL NOTES;

REPRODUCTIVE; Normal

PARASITES; SAVED?

OTHER ABNORMALITIES; Lower jaw - left incisor broken off

INTERNAL NOTES;

REPRODUCTION;

PARASITES; Normal SAVED?

OTHER ABNORMALITIES; Left codal liver lobe a pale white discoloration.

HISTOPATH SAMPLES;

LIVER TOTAL WEIGHT; 26.7g

LIVER SAMPLE WEIGHT; 0.3g

KIDNEY TOTAL WEIGHT
RIGHT KIDNEY; 1.8g
LEFT KIDNEY; 1.9g

KIDNEY SAMPLE WEIGHT; 0.9g

SPECIAL COMMENTS;

EAR MEASUREMENT; INTERIOR POINT OF TRAGUS TO EXTERIOR POINT OF APEX

HINDFOOT MEASUREMENT; CRANIAL POINT OF TARSAL PAD TO MOST DISTAL POINT OF CAUDAL PHALANGEAL PAD.

Chad A Kil 8/12/93

Specimen Identification No. BC270305MR

Catalog No. 081293BC270305MR

Site Name API-PC-KR

Day 12 Mo. 08 Year 93 Time of Collection 1502

Sex (M) F Genus Ondatra Species (Muskrat) Zibethicus

TL 460 mm Tail 189 mm HF 69 Ear 25 Wt. 767 gm

Collector Mike Harris Trap No. BC27

Trap Type Steelless Leghold Victor #1 Live (Dead)

REPRODUCTIVE DATA:

MALE- Testis: L _____ W _____ Wt. _____

Seminal Vesicles: *Minute* *Small* *Large* Epididymis: *Convoluted* *Not Conv.*

FEMALE- Embryos R _____ L _____ Crown Rump _____ *Saved* *Discarded*

Placental Scars R _____ L _____ Corpora Lutea R _____ L _____

Mammary Development: *Small* *Large* *Lactating* Ovary Wt. _____

Vagina: *Inactive* *Cornified* *Turgid* *Plugged*

Reproductive Stage: *Nulliparous* *Semiparous* *Multiparous*

Comments: _____

SPECIAL COLLECTIONS:

Ectoparasites: Y N _____ *SAVED* *DISCARDED*

Endoparasites: Y N _____ *SAVED* *DISCARDED*

Stomach Contents: Y N _____ *SAVED* *DISCARDED*

Other- _____ _____ *SAVED* *DISCARDED*

Other- _____ _____ *SAVED* *DISCARDED*

ORGAN	WEIGHTS	HISTO. SAVED	PRESERVATIVE (SEE BELOW)	ABNORMALITIES/ COMMENTS
Liver	26.7g	(Y) N	1	
Spleen		Y N		
Kidney	L 1.9g R 1.8g C	(Y) N	1	
Adrenal	L R C	Y N		
		Y N		
		Y N		

PRESERVATIVE: 1) 4% BUFFERED PARAFORMALDEHYDE, 2) BOUINS, 3) ALCOHOL, 4) _____, 5) _____

APPENDIX D
ERT/REAC SPECIMEN DATA SHEETS

Location No. 081193BC380203MR Sample No. 279

Site Name Kalamazoo River Date Collected 8/11/93

Collector M.H.

Processor Phil Kim Date Processed 8/25/93

Trap Type ~~Conibear~~ (PR) Leghold Live (Dead) (circle one)

Genus Ondatra Species ~~zibethica~~

Total(mm) 515 Tail 203 Hind Foot 70 Ear 13

Weight(g) 892 Partial (Whole) (circle one)

Ectoparasites: Y (N) Saved Discarded (circle one)

Endoparasites: (Y) N tapeworm Saved (Discarded) (circle one)

Male

L Testicle: L 8 W 6

R Testicle: L 7 W 6

Testicle Wt: L 0.071 R 0.061 C 0.130

Seminal Vesicle: (Small) Large (circle one)

Epididymis: Conv. (Not Conv) (circle one)

Female

Left Ovary L____ W____

Right Ovary L____ W____

Ovary Weight L____ R____ C____

Placental Scars L____ R____

Embryos L____ R____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries ____ w/o Ovaries ____

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver 31.006	~~30.206~~ @	(Y) N	0°	wt L Lb → 38.4g
Spleen	0.913	Y (N)	0°	
Adrenal	L 0.134 / R 0.114	Y (N)	0°	
Kidney		Y N		
Thymus	0.955	Y (N)	0°	
		Y N		
		Y N		
		Y N		

L 3.946g 28mm × 20mm

R 4.166g 30mm × 19mm

State Kidney wts. → L 4.7g, R 4.8g

(over)

weight of liver w/ histo sample 31.906

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs:	(Juvenile)	Subadult	Adult	(circle one)
Age Based on Body Size:	(Juvenile)	Subadult	Adult	(circle one)
Age Based on Pelage:	(Juvenile)	Subadult	Adult	(circle one)

Comments: White mottling on both kidneys. 3 focal lesions, spherical in design, smallest is 8mm, 10 mm (medium), 13mm (largest) in diameter

Kidney sample w/ lesion was submitted for histo.

Trapped w/ food in mouth.

Worksheet:

Location No. 081293 BC 270305 MR Sample No. 2 of 1

Site Name Kalamazoo River Date Collected 8-12-93

Collector @. M.H. Mike Harris

Processor Tony Scrittorale Date Processed 8-31-93

Trap Type Leghold Live (Dead) (circle one)

Genus Ondatra Species Zibethica

Total(mm) 480 mm Tail 189 mm Hind Foot 69 mm Ear 25 mm

Weight(g) 707 g Partial (Whole) (circle one)

Ectoparasites: Y (N) Saved Discarded (circle one)

Endoparasites: Y (N) Saved Discarded (circle one)

Male

L Testicle: L ~~25 mm~~ (PR) W ~~14 mm~~ (PR)

R Testicle: L ~~24 mm~~ (PR) 5 W 4 ~~15 mm~~ (PR)

Testicle Wt: L ~~1.407 g~~ (PR) R ~~1.8 g~~ (PR) C 1.4

0.067 0.071

Seminal Vesicle: (Small) Large (circle one)

Epididymis: Conv. (Not Conv.) (circle one)

Female

Left Ovary L_____ W_____

Right Ovary L_____ W_____

Ovary Weight L_____ R_____ C_____

Placental Scars L_____ R_____

Embryos L_____ R_____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries _____ w/o Ovaries _____

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver	25.445 g	(Y) N	0°	State wt. 26.7 g
Spleen	0.612	Y (N)		
Adrenal	L 0.075 R 0.070	Y (N)		
Kidney	See Below	(Y) N		
Thymus	~~0.612~~ (PR)	Y (N)		
		Y N		
		Y N		
		Y N		

- Left Kidney 1.907 g 25 x 14 mm / State → L 1.9 g
  Right Kidney 1.8 g 24 x 15 mm R 1.9 g

Missing: Thymus weight.

liver wt w/histo section - 25.745 g

(over)

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs: Juvenile Subadult Adult (circle one)

Age Based on Body Size: Juvenile Subadult Adult (circle one)

Age Based on Pelage: Juvenile Subadult Adult (circle one)

Comments: Lower-L (PR)

lower jaw - left incisor broken off

dorsal lower left a pale white discoloration

Worksheet:

Location No. 08119380370202MR Sample No. 278

Site Name Kalamazoo River Date Collected 8/11/93

Collector ~~M.H.~~ (PL) Mike Harris

Processor Phil Kim Date Processed 8/31/93

Trap Type Conibear Live (Dead) (circle one)

Genus Ondatra Species zibethica

Total(mm) 595 Tail 236 Hind Foot 71 Ear 11

Weight(g) 1,339 g Partial (Whole) (circle one)

Ectoparasites: Y (N) Saved Discarded (circle one)

Endoparasites: Y (N) Saved Discarded (circle one)

Male N/A

L Testicle: L____ W____

R Testicle: L____ W____

Testicle Wt: L____ R____ C____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Left Ovary L 11mm W 7mm

Right Ovary L 9mm W 6mm

Ovary Weight L 0.021 R 0.057 C N/A

Placental Scars L — R —

Embryos L — R — (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries ____ w/o Ovaries ✓

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver	50.207	(Y) N	0°	State → 13.0 g
Spleen	0.836	Y (N)	0°	
Adrenal	(L) 0.416 / (R) 0.220	Y (N)	0°	
Kidney		(Y) N	0°	
Thymus	0.357	Y (N)	0°	
~~Ovary~~	~~(L) 0.021 (R) 0.057~~	~~Y N~~		
		Y N		
		Y N		

L 4.476 *

R 2.152 + 2.4 = 4.552

(State L 5.3 R 4.9 (over))

Missing:
Kidney length & width

weight of liver 4histo sample - 50.8 g

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs: Juvenile Subadult Adult (circle one)

Age Based on Body Size: Juvenile Subadult Adult (circle one)

Age Based on Pelage: Juvenile Subadult Adult (circle one)

Comments: Minor discoloration left cranial edge of left lobe of liver. 1 yellow colored spot (2.5 mm diam. on caudal right lobe of liver, also spherical.

Sample w/ lesion

Worksheet:

Location No. 081293BC380306 MR Sample No. 282

Site Name Kalamazoo Date Collected 8-11-93 (KK) 12

Collector @M.H. Mike Harris

Processor Tony Scitforale Date Processed 8-31-93

Trap Type Leghold Live (Dead) (circle one)

Genus Ondatra Species Zibethica

Total(mm) 504 mm Tail 205mm Hind Foot 70mm Ear 27 mm

Weight(g) 839 Partial (Whole) (circle one)

Ectoparasites: Y (N) Saved Discarded (circle one)

Endoparasites: Y (N) Saved Discarded (circle one)

Male

L Testicle: L 8mm W 5mm

R Testicle: L 7mm W 4mm

Testicle Wt: L .055g R .06g C —

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Left Ovary L____ W____

Right Ovary L____ W____

Ovary Weight L____ R____ C____

Placental Scars L____ R____

Embryos L____ R____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries ____ w/o Ovaries ____

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver	24.964g	(Y) N	0°	State 30.9g
Spleen	.822g	Y (N)	0°	
Adrenal	R-.085, L-.074g	Y (N)	0°	
Kidney	See Below	(Y) N	0°	
Thymus	.914	Y (N)		
		Y N		
		Y N		
		Y N		

Right Kidney - 1.836g (Y) 0° 23mm long, 14mm wide / State 2.2g L

Left Kidney - 1.87 Y (N) 0° 24mm long, 16mm wide / 2.0g R

(over)

weight of liver w/ histo section - 25.064g

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs: Juvenile Subadult Adult (circle one)

Age Based on Body Size: Juvenile Subadult Adult (circle one)

Age Based on Pelage: Juvenile Subadult Adult (circle one)

Comments: 8 mm dia. lesion on rt. caudal lobe, medial.

Worksheet:

Location No. 8010938C21616MR Sample No. 277

Site Name Kalamazoo River Date Collected 8-10-93

Collector Mike Harris and Heather Kirschbaum

Processor Matt Donohue Date Processed 8-31-93

Trap Type Legbold Live (Dead) (circle one)

Genus Onclatra Species Tibethica

Total(mm) 614 mm Tail 280mm Hind Foot 87 mm* right (pad to pad) Ear 28mm (right ear)

Weight(g) 1513 g Partial (Whole) (circle one)

Ectoparasites: Y (N) Saved Discarded (circle one)

Endoparasites: Y (N) Saved Discarded (circle one)

Male

L Testicle: L 20mm W 12mm

R Testicle: L 22mm W 12mm

Testicle Wt: L .875g R .865g C 1.744g

Seminal Vesicle: Small (Large) (circle one)

Epididymis: (Conv.) Not Conv. (circle one)

Female

Left Ovary L____ W____

Right Ovary L____ W____

Ovary Weight L____ R____ C____

Placental Scars L____ R____

Embryos L____ R____ (if present, use worksheet on back to record measures)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries ____ w/o Ovaries ____

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver	52.845	(Y) N	0°	State weight 56.2g
Spleen	.851	Y (N)	0°	
Adrenal	L-.455g R-.311g	Y (N)	0°	
Kidney	L-4.46g R-3.88g	(Y) N	0°	State weights - L-4.5g R-4.1g
Thymus	.655g	Y (N)	0°	
		Y N		
		Y N		
		Y N		

		R	L
Kidney	Length	29mm	33mm
	width	20mm	24mm
~~Testes~~	~~Length~~	R 22mm	L (over)
	~~width~~	~~12mm~~	

~~Kidney~~ wts w/histo sections (Y)
L-4.46
R-

Liver sample w/ histo section - 53.145

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs:	Juvenile	Subadult	**Adult** (circle one)
Age Based on Body Size:	Juvenile	Subadult	**Adult** (circle one)
Age Based on Pelage:	Juvenile	Subadult	**Adult** (circle one)

Comments: 2 minor discolorations on liver. 4 mm diam. each Pale areas surface.

Worksheet:

Location No. (GB) 8 08 1293 BC 210304 MR Sample No. 280

Site Name Kalamazoo River Date Collected 8/12/93

Collector ~~mtf~~ @ Mike Harris

Processor M. Donohue Date Processed 8/31/93

Trap Type Leghold Live Dead (circle one)

Genus Ondatra Species Zibethica

Total(mm) 511m Tail 226 mm Hind Foot 71 mn Ear 24mm

Weight(g) 740 gm Partial Whole (circle one)

Ectoparasites: Y (N) Saved Discarded (circle one)

Endoparasites: Y (N) Saved Discarded (circle one)

Male

L Testicle: L 7 W 5

R Testicle: L 8 W 5

Testicle Wt: L 0.077 R 0.075 C _____

Seminal Vesicle: (Small) Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Left Ovary L _____ W _____

Right Ovary L _____ W _____

Ovary Weight L _____ R _____ C _____

Placental Scars L _____ R _____

Embryos L _____ R _____ (if present, use worksheet on back to record measures)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries _____ w/o Ovaries _____

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver	28.15g	(Y) N	0°	State weight → 38.4g
Spleen	0.827	Y (N)	0°	
Adrenal	L 0.095 R 0.107	Y (N)	0°	
Kidney	_____	(Y) N	0°	
Thymus	1.268	Y (N)	0°	
~~Testes (weight)~~	~~L 0.077 R 0.075~~	Y N		
Testes (measure) L - length	width	Y N		
_____	_____	Y N		

Missing:

Kidneys

R 1.832g L 1.738g (Y) N 0°c

State weight R 2.1g

Kidney length & width.

(over)

weight of liver w/ histo sample 28.45g

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs: Juvenile Subadult Adult (circle one)

Age Based on Body Size: Juvenile Subadult Adult (circle one)

Age Based on Pelage: Juvenile Subadult Adult (circle one)

Comments: _____

Worksheet:

Location No. 120893 BG130303 Sample No. 12/10/93 - 766

Site Name KALAMAZOO RIVER Date Collected 12/8/93

Collector MIKE HARRIS (CDM)

Processor BOVITZ Date Processed 12/10/93

Trap Type 1.5 DOUBLE COIL Live (Dead) (circle one)

Genus ONDATRA Species ZIBETHICUS

Total(mm) 530 MM Tail 230.5 MM Hind Foot 67 MM Ear —

Weight(g) 1179.9 carcass including colon (121 g) (Partial) Whole (circle one)

Ectoparasites: Y (N) stomach empty (10.52 g) Saved Discarded (circle one)

Endoparasites: Y (N) Saved Discarded (circle one)

Male N/A

L Testicle: L____ W____

R Testicle: L____ W____

Testicle Wt: L____ R____ C____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Left Ovary L 8 MM W 4 MM

Right Ovary L 9 MM PB W 4 MM ~~.0057g~~ PB

Ovary Weight L ~~.0057g~~ R .0622g C____

Placental Scars L 8 R 5

Embryos L N/A R____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi (Multi) (circle one)

Uterus w/ Ovaries 11.221 g w/o Ovaries ____

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver	~~47.788~~ 47.788	Y N		
Spleen	0.92 g	Y N		
Adrenal	0.176, 0.075 g	Y N		
Kidney	2.578, 2.138* g	Y N		
Thymus	1.674 g	Y N		
		Y N		
Uterus w/fat	11.221 g	Y N		
		Y N		

* w/o section

Whole body carcass 24426

Liver 24427

Kidney 24428

(over)

Pt weight - 235.22g (frozen)

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments: _____

Worksheet:

Total fresh wt.	1441 g	
Carcass wt	1047.98 g	
Liver	47.78 g	48.78 g
Kidneys	5.716 g	6.918 g

Location No. 120893B3G27A0302M12 Sample No. 121093-765

Site Name Kalamazoo River Date Collected 12/08/93

Collector Mike Harris (CDM)

Processor Matt Donohue Date Processed 12/10/93

Trap Type 1.5 long Spiral Live Dead (circle one)

Genus Ondaxtra Species Zibethica

Total(mm) 515 Tail 215 Hind Foot 70 Ear ____

Weight(g) 934.7g Partial Whole (circle one)

Ectoparasites: Y N ____ Saved Discarded (circle one)

Endoparasites: Y N ____ Saved Discarded (circle one)

Male

L Testicle: L ____ W ____

R Testicle: L ____ W ____

Testicle Wt: L ____ R ____ C ____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Left Ovary L 9 W 5

Right Ovary L 8 W 7

Ovary Weight L 0.100 R 0.094 C —

Placental Scars L — R —

Embryos L — R — (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: (Nulli) Semi Multi (circle one)

Uterus w/ Ovaries — w/o Ovaries 0.675 w/fat

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver	40.594	(Y) N		
Spleen	0.471	Y N		
Adrenal	L 0.137 R 0.112	Y N		
Kidney	L 1.165 R 2.759	(Y) N		left kidney partial 2.425
Thymus	0.514	Y N		
		Y N		
		Y N		
		Y N		

Pelt weight - 241.31g (over)
(frozen)

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs: Juvenile Subadult Adult (circle one)

Age Based on Body Size: Juvenile Subadult Adult (circle one)

Age Based on Pelage: Juvenile Subadult Adult (circle one)

Comments: _____

Worksheet:

Total fresh wt 1180 g
Carcass wt 934.7 g
Liver wt 46.594 ; 41.394 g total liver
Kidneys 3.92 g 5.22g total kidney

Location No. 120893BG140304 MR Sample No. 12/093 - 767

Site Name Kalamazoo River Date Collected 12/8/93

Collector Mike Harris

Processor ~~Matt Donohue~~ (PR) Phil Kim Date Processed 12/10/93

Trap Type Double coil Live (Dead) (circle one)

Genus Odantra Species Zibethicus

Total(mm) 540mm Tail 230mm Hind Foot (R) 70mm Ear —

Weight(g) ~~1274~~ 994.5 [78] Partial Whole (circle one)

Ectoparasites: Y (N) Saved Discarded (circle one)

Endoparasites: Y (N) Saved Discarded (circle one)

Male

L Testicle: L____ W____

R Testicle: L____ W____

Testicle Wt: L____ R____ C____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Left Ovary L 7 W 4

Right Ovary L 6 W 5

Ovary Weight L 0.034 R 0.032 C —

Placental Scars L — R — —

Embryos L — R — (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage (Nulli) Semi Multi (circle one)

Uterus w/ Ovaries — w/o Ovaries 0.107

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver 36.747	~~1.276~~ (PR)	(Y) N		
Spleen	1.276	Y N		
Adrenal	L 0.080 R —	Y N		No right adrenal
Kidney	L 1.432 R 2.499	(Y) N		Left kidney partial 2.5??
Thymus	0.793	Y N		
		Y N		
		Y N		
		Y N		

* Specimen partially frozen upon reciept for processing

(over)

Pelt weight - 235.21g
(frozen)

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs:	Juvenile	(Subadult)	Adult	(circle one)
Age Based on Body Size:	Juvenile	(Subadult)	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments: _____

Worksheet:

Total fresh wt	1274 g
Carcass wt	994.5
Liver wt	36.75
Kidneys	3.93

~~37.5~~ PB Total liver 37.45

Total kidney 5.03g

Location No. 120893R62 10305 Sample No. 121093-268

Site Name Kalamazoo River Date Collected 12/8/93

Collector Mike Harris

Processor Matt Donahue Date Processed 12/10/93

Trap Type 1.5 Long Coil Live (Dead) (circle one)

Genus Ondatra Species zibethicus

Total(mm) 484 Tail 234 Hind Foot 64 Ear _____

Weight(g) 694 537.98g Partial (Whole) (circle one)

Ectoparasites: Y N _____ Saved Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

L Testicle: L 9mm W 5mm

R Testicle: L 8mm W 5mm

Testicle Wt: L.077 R.082 C _____

Seminal Vesicle: (Small) Large (circle one)

Epididymis: Conv (Not Conv) (circle one)

Female

Left Ovary L _____ W _____

Right Ovary L _____ W _____

Ovary Weight L _____ R _____ C _____

Placental Scars L _____ R _____

Embryos L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries _____ w/o Ovaries _____

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver	23.15g	(Y) N		part of liver removed prior to weighing for histo
Spleen	.428g	Y N		
Adrenal	L-.083g R-.066g	Y N		
Kidney	R-3.19g L-1.45g	Y N		3/4 of left kidney removed for histo 2.05
Thymus	.42g	Y N		
		Y N		
		Y N		
		Y N		

Pelt weight - 116.14g
(Frozen)

(over)

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments: _____

Worksheet:

Total fresh wt 691 g
Carcass 537.98 g
Liver 23.15 g Total liver 23.95 g
Kidneys 3.64 g Total kidneys 4.44 g

120893-

Location No. B637030 7 MR Sample No. 121093-770

Site Name Kalamazoo River Date Collected 12/8/93

Collector Mike Harris

Processor Phil Kim Date Processed 12/10/93

Trap Type Long Spring Live (Dead) (circle one)

Genus Ondatra Species zibethicus

Total(mm) 564 Tail 253 Hind Foot 71 Ear ——

Weight(g) ~~135 F 1021.1 M~~ 1071.1 g Partial Whole (circle one)

Ectoparasites: Y (N) Saved Discarded (circle one)

Endoparasites: Y (N) Saved Discarded (circle one)

Male

L Testicle: L 12 W 7

R Testicle: L 12 W 8

Testicle Wt: L 0.412 R 0.396 C ——

Seminal Vesicle: Small (Large) (circle one)

Epididymis: (Conv.) Not Conv. (circle one)

Female

Left Ovary L ____ W ____

Right Ovary L ____ W ____

Ovary Weight L ____ R ____ C ____

Placental Scars L ____ R ____

Embryos L ____ R ____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries ____ w/o Ovaries ____

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver	47.771	(Y) N		
Spleen	0.869	Y N		
Adrenal	L 0.193 R 0.172	Y N		
Kidney	L 1.342* R 3.080	(Y) N		Left kidney partial 2.492
Thymus	0.719	Y N		
		Y N		
		Y N		
		Y N		

Pelt weight - 218 95g
(frozen)

(over)

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult (circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult (circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult (circle one)

Comments: _____

Worksheet:

Total fresh wt. 1357 g
Carcass wt. 1071.1 g
Liver wt. 47.27 g 47.97 g
Kidney wt. 4.47 g 5.57 g

Location No. 86360306 MR Sample No. 121093 – 769

Site Name Kalamazoo River Date Collected 12/8/93

Collector Mike Harris

Processor Tony Scrittorale Date Processed 12/10/93

Trap Type Conq Spring Live (Dead) (circle one)

Genus Ondatra Species zibethicus

Total(mm) 550mm Tail 290mm Hind Foot 70mm Ear —

Weight(g) 896.8 9 Partial Whole (circle one)

Ectoparasites: Y (N) Saved Discarded (circle one)

Endoparasites: Y (N) Saved Discarded (circle one)

Male

L Testicle: L 15mm W 10mm

R Testicle: L 14mm W 10mm

Testicle Wt: L .896g R .700g C _____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Left Ovary L _____ W _____

Right Ovary L _____ W _____

Ovary Weight L _____ R _____ C _____

Placental Scars L _____ R _____

Embryos L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries _____ w/o Ovaries _____

	ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
	Liver	41.072g	Y N		
	Spleen	.704g	Y N		
R	Adrenal	.09 g	Y N		
R	Kidney	3.035g	Y N		Left 3.11a
	Thymus	.464g	Y N		
			Y N		
			Y N		
			Y N		Tw 11.72.67
L	Adrenal	.113			
L	Kidney	1.86			

(over)

Pelt weight 229.80g (frozen)

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs: Juvenile Subadult Adult (circle one)

Age Based on Body Size: Juvenile Subadult Adult (circle one)

Age Based on Pelage: Juvenile Subadult Adult (circle one)

Comments: _____

Worksheet:

Total fresh wt 1186 g (DNR)
Carcass wt 896.9 g
Liver wt 41.07 g Total liver 42.17 g
Kidney wt 4.895 g Total kidney 6.195 g

Stomach + GI contents (by subtraction) = 13.33 g
+ lower gi

Location No. 12109 3BG 540502 MIK Sample No. ~~BG~~ 121593-804

Site Name KALAMAZOO RIVER Date Collected 12/10/93

Collector ~~MK~~ (1210) Mike Harris

Processor PAUL BOVITZ Date Processed 12/15/93

Trap Type 1.5 DOUBLE COIL FOOTHOLD Live (Dead) (circle one)

Genus MUSTELA Species VISON

Total(mm) 569 mm Tail 190 mm Hind Foot 29 mm Ear —

Weight(g) 901.2 g carcass without pelt (Partial) Whole (circle one) pelt 361.4 g

809.2 g carcass without pelt, lower jaw, liver, kidneys and GI content / without pelt trimmings

Ectoparasites: Y N SUCKING LICE Saved (Discarded) (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male Female N/A

L Testicle: L 23 mm W 13 mm Left Ovary L • W _____

R Testicle: L 21 mm W 13 mm Right Ovary L _____ W _____

Testicle Wt: L ~~1.327~~ 0.97 g R 0.983 g C* _____ Ovary Weight L _____ R _____ C _____

Seminal Vesicle: Small (Large) (circle one) Placental Scars L _____ R _____

Epididymis: (Conv.) Not Conv. (circle one) Embryos L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

* trimmed off epididymis

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries _____ w/o Ovaries _____

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver	50.69	Y N		histo sections 0.29 g ; liver light reddish tan color 0.49 g
Spleen	3.198 g	Y (N)		
Adrenal	R = 0.0375 0.081 L	Y N		
Kidney	5.295 g, 2.512	Y N		histo section 0.4 g 4.4 :
Thymus	0.95 g	** Y N		
		Y N		
		Y N		
		Y N		Jaw 1150.15 stomach empty + GI tract contents 5.85 g lower jaw 8.5 g

* Right adrenal hacked in half during initial processing. (over)

** Right kidney was sectioned. Weight recorded without section.

26.50 g of tissue trimmed from pelt and added to carcass

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments: _____

Worksheet:

Total fresh wt.	1136 g		
Carcass wt.	809.2 g		
Liver wt.	50.6 g	Total liver	51.2
Kidney wt.	7.81 g	Total kidney	9.71

Notes for Michigan staff:
don't remove both kidneys
if medial lobe can be removed without removing liver, do so
COC for histo. separate
inconsistency in kidney

Location No. 120993B6 47 0410101 MK Sample No. 121593-803

Site Name Kalamazoo River Date Collected 12/09/93

Collector Mike Harris (CDM)

Processor Matt Donohue Date Processed 12/15/93

Trap Type 1½ dbl coil leg hold Live (Dead) (circle one)

Genus Mustelidae Species vison

Total(mm) 460 mm Tail 87 mm Hind Foot 13 mm Ear _____

Weight(g) * before organ removal - ~~881.6g~~ 931.8g (Partial) Whole (circle one)
w/o Liver, kidneys, colon contents, lower jaw - 824.5g

Ectoparasites: Y N _____ Saved Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

L Testicle: L ~~17 mm~~ 15 mm W 8 mm

R Testicle: L 17 mm W 10 mm

Testicle Wt: L .6g R .6g C _____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. (Not Conv.) (circle one)

Female

Left Ovary L _____ W _____

Right Ovary L _____ W _____

Ovary Weight L _____ R _____ C _____

Placental Scars L _____ R _____

Embryos L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries _____ w/o Ovaries _____

ORGAN	WEIGHT	HISTO	PRESERV.		COMMENTS
Liver	49.4g	(Y) N	_____		Liver weighed after histo sample was removed
Spleen	~~4.052g~~	Y N	_____		
Adrenal	~~L-.0769 R-.0876g~~ R-.0849g	Y N	_____		R adrenals surrounded by fat masses
Kidney	L-4.2g R-2.6	(Y) N	_____	4.1	½ of L kidney removed for histo prior to weighing
Thymus	.299g	Y N	_____		
_____	_____	Y N	_____		
_____	_____	Y N	_____		
_____	_____	Y N	_____		In 10%

(over)

* without pelt

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments: Animal arrived frozen for processing

Worksheet: Lower Jaw - 6.65g

Full Colon - 22.75g

weight of ~~GI~~ colon contents - 9.00g - Greenish-yellow

weight of empty colon - ~~13.90~~ 13.75g

Sm intestine w/connective tissue - 39.10g

Full Stomach - 8.60g

no Stomach contents

Pelt before scrapings - 284.9g

pelt scrapings - 32.20g

weight of pelt after scraping 252.71g

Total fresh wt 1252 g

Carcass wt 824.5 g

Liver wt 49.4 g

Kidney wt 6.8 g

Total liver 50g

Total Kidney 8.3 g

Location No. 1213 93 BG610703MK Sample No. 121593 - 805

Site Name Kalamazoo River Date Collected 12/13/93

Collector Mike Harris

Processor Phil Kim Date Processed 12/15/93

Trap Type Conibear 110 Live (Dead) (circle one)

Genus ~~Mustela~~ Mustela Species vison * (See comments on reverse)

Total(mm) 566 Tail 185 Hind Foot 24.5 Ear ——

Weight(g) Before eyan removal: 735.99 w/o liver, kidney, GI contents, jaw: 664.3 g (Partial) Whole (circle one)

Ectoparasites: Y (N) —— Saved Discarded (circle one)

Endoparasites: Y (N) —— Saved Discarded (circle one)

Male	Female
L Testicle: L 25 W 12	Left Ovary L ____ W ____
R Testicle: L 22 W 13	Right Ovary L ____ W ____
Testicle Wt: L ~~3.442~~ 1.239 (1.24) R 1.309 C —	Ovary Weight L ____ R ____ C ____
Seminal Vesicle: (Small) Large (circle one)	Placental Scars L ____ R ____
Epididymis: Conv. (Not Conv.) (circle one)	Embryos L ____ R ____ (if present, use worksheet on back to record metrics)
	Mammaries: Small Large Lactating (circle one)
	Vagina: Inactive Cornified Turgid Plugged (circle one)
	Repr. Stage: Nulli Semi Multi (circle one)
	Uterus w/ Ovaries ____ w/o Ovaries ____

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver	47.480	(Y) N	____	section taken for histo
Spleen	3.005	Y N	____	
Adrenal	L 0.048 R 0.061	Y N	____	Identification questionable
Kidney	L 4.915 R 2.321**	(Y) N	____	** Right kidney partial 4.001
Thymus	0.391	Y N	____	
____	____	Y N	____	
____	____	Y N	____	
____	____	Y N	____	Tag 420.18

(over)

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs: Juvenile Subadult Adult (circle one)

Age Based on Body Size: Juvenile Subadult Adult (circle one)

Age Based on Pelage: Juvenile Subadult Adult (circle one)

Comments: * Animal arrived frozen.

Worksheet: Pelt before scraping : 166.5 Scrapings : 18.747
Pelt after scraping 146.2

Full stomach : 15.010 g
Stomach contents : 13.0 g, liquid, dark olive w/ white gelatinous globs.
Empty stomach : 9.693 g

Sm Intestine : 36.769 g

Full colon : 21.226 g
Contents : 5.818 g, dark olive, black, and red gel.
Empty colon : 14.377 g

Lower jaw : 4.280 g

Total fresh wt. 919 g (DNR)
Carcass wt. 664.3 g
Liver wt. 47.48 g total liver 48.28 g
Kidney wt. 7.24 g total kidney 9.14 g

Location No. 121493BG340804 Sample No. 121693-836

Site Name Kalamazoo River Date Collected 12/14/93

Collector M. Harris (CDM)

Processor Matt Donohue Date Processed 12/16/93

Trap Type 1½ leghold Live ~~Dead~~ (circle one)

Genus Mustelidae - M Species vison

Total(mm) 540 Tail 172 Hind Foot 23 Ear —

w/o pelt, ~~organs~~ and beke organ removed - 833.1

Weight(g) w/o pelt, liver, kidneys, lower jaw, ~~GI~~ colon contents Partial Whole (circle one)
756.8g

Ectoparasites: Y (N) Saved Discarded (circle one)

Endoparasites: Y N Saved Discarded (circle one)

Male

L Testicle: L 17 W 11

R Testicle: L 18 W 11

Testicle Wt: L 0.70g R 0.75g C

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. (Not Conv.) (circle one)

Female

Left Ovary L W

Right Ovary L W

Ovary Weight L R C

Placental Scars L R

Embryos L R (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries w/o Ovaries

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver	43.487g	(Y) N		2 histo sections removed prior to weighing. weight of liver sections .5g + .5g
Spleen	2.401g	Y N		
Adrenal	L-.045 R-0.038g	Y N		adrenals appear yellow in color
Kidney	L-4.29g R-2.140g	(Y) N	4, 140	½ right kidney removed for histo prior to weighing weight of section 2g
Thymus	.817g	Y N		
		Y N		
		Y N		
		Y N		in 1659.31

(over)

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs: Juvenile **Subadult** Adult (circle one)

Age Based on Body Size: Juvenile Subadult Adult (circle one)

Age Based on Pelage: Juvenile Subadult Adult (circle one)

Comments: Sample ~~rected~~ recieved frozen for processing

Worksheet: weight of Stomach- 7.720g
No stomach contents

weight of colon - 17.579
weight of colon contents - 3.697 - Thick, black substance, gelatinous
weight of empty colon - 13.882

sm intestines - 32.560

Lower jaw - 7.425g

pelt - 221.3g

reH scrapings - 23.599g

Total wt (fresh) 1063 g
Carcass wt. 756.8 g
Liver wt. 43.49 g Total liver 44.29 g
Kidney wt. 6.43 g Total kidney 8.43 g

Location No. Test Sample rat Sample No. NA

Site Name Kalamazoo River Date Collected 12/15/93

Collector Mike Harris

Processor Phil Kim Date Processed 12/16/93

Trap Type Leghold Live (Dead) (circle one)

Genus Oodaten Species Fibethicus

Total(mm) 470 Tail 204 Hind Foot 68 Ear —

w/o pelt & Before organ removal: 574.0 g

Weight(g) w/pelt scrapings, w/o liver, kidney 473.6 (Partial) Whole (circle one)

GI contents

Ectoparasites: Y (N) Saved Discarded (circle one)

Endoparasites: Y (N) Saved Discarded (circle one)

Male

L Testicle: L ____ W ____

R Testicle: L ____ W ____

Testicle Wt: L ____ R ____ C ____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Left Ovary L — W — (Ovaries undeveloped)

Right Ovary L — W —

Ovary Weight L — R — C —

Placental Scars L — R —

Embryos L — R — (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: (Inactive) Cornified Turgid Plugged (circle one)

Repr. Stage: (Nulli) Semi Multi (circle one)

Uterus w/ Ovaries — w/o Ovaries —

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver (DL)	~~24.790~~ 23.685	(Y) N		
Spleen	0.265	Y N		
Adrenal	L 0.063 R 0.060	Y N		
Kidney	L 1.428 R [0.885]	(Y) N		1.475
Thymus	0.195	Y N		
		Y N		
		Y N		
		Y N		
		Y N		w 622.08

(over)

Dorsal Pelage Color _____ Ventral Pelage _____ Side Pelage _____

Age Based on Sex Organs:	(Juvenile)	Subadult	Adult	(circle one)
Age Based on Body Size:	(Juvenile)	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments: Specimen shows no obvious signs of decomposition (shipped on ice) but exhibits ~~strong~~ (F) odor of ~~slight~~ (M) moderate decomposition.

Worksheet:

Full colon : 60.027g
Colon contents : 40.160g (w/o lower colon contents)
Empty colon : 10.945g

Lower colon contents : 6.532g
Empty lower colon : 1.007g

Full stomach 3~~5~~ 38.862g
Stomach contents 32.762g
Empty stomach ~~56.4~~ (PIC) 5.642g

Pelt 111.4g
Pelt scrapings : 20.995g

Lower jaw : 3.169g

Total fresh wt 695
Carcass wt 473
Liver wt 23.69
Kidney wt 2.[illegible]g

Total liver 24.[illegible]g
Total kidney 2.81

13
2 3/4/17
1885
1532

Site Name Kalamazoo River

Collector Mike Harris (CDM) Date Collected 12/17/93

Processor Matt Donohue Date Processed 12/21/93

Trap Type 15 Dauble coil Leg Hold Live (Dead) (circle one)

Genus/Species Mustela ~~fatar~~ PB vison

Total(mm) 648 Tail (mm) 213 Hind Foot (mm) 28 Ear (mm) —

w/o pelt - 1110.5g

Weight(g) w/o pelt, lowerjaw, kidneys, liver, colon contents. 1026.6g Partial Whole (circle one)

Ectoparasites: Y N _____ Saved Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L 809g R ~~.8276~~ .845

L Testicle (mm): L 18mm W 12mm

R Testicle (mm): L 18mm W 13mm

Seminal Vesicle: (Small) Large (circle one)

Epididymis: Conv. (Not Conv.) (circle one)

Female

Ovary Weight (g): L _____ R _____

Left Ovary (mm): L _____ W _____

Right Ovary (mm): L _____ W _____

Placental Scars L _____ R _____

Embryos (no.) L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	48.6173g	liver section taken for histo. prior to weighing
Spleen	2.873g	
Adrenal	L ~~0.059~~ 0.0559 R 0.048	
Kidney	L 5.54 R 2.419	1/2 of R. kidney removed for histo. prior to weighing 4.79
Thymus	.98g	
		TW 1471.67

(over)

Age Based on Sex Organs:	Juvenile	(Subadult)	Adult (circle one)
Age Based on Body Size:	Juvenile	(Subadult)	Adult (circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult (circle one)

Comments:

Fresh total wt 1522 ~~695~~ PB g
Carcass wt 1026.6 g
Liver wt 43.60 g Total liver wt 44.5 g
Kidney wt 8.03 g Total kidney wt 10.33 g

Worksheet:

weight of stomach - 8.485g
No measurable stomach contents - Some thick black residue on walls of stomach

weight of Colon - 31.19g
weight of colon contents - 11.33g
weight of empty colon - 19.86g

weight of Small intestines - 44.06g

weight of lower jaw - 7.46g

weight of pelt Before scraping 359.9g
weight of Scraped material - 21.7g
pelt after scraping - 338.2g

Location No. 012794 0D120205 MR Sample No. _____

Site Name KALAMAZOO RIVER - TRIBEC DAM

Collector DR. M. HARRIS Date Collected 12/7/94

Processor F BUNTZ Date Processed 12/9/94

Trap Type CONIBEAR 110 Live (Dead) (circle one)

Genus/Species ONDATRA ZIBETHICUS

Total(mm) 611 mm Tail (mm) 266 mm Hind Foot (mm) 76 mm Ear (mm) _____

Weight(g) 1264 g total, 1051.4 carcass, 199.6 pelt including fat Partial Whole (circle one)

Ectoparasites: Y N SUCKING MITES Saved Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L _____ R _____

L Testicle (mm): L 18mm W 13mm

R Testicle (mm): L 18mm W 13mm

Seminal Vesicle: Small (Large) (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Ovary Weight (g): L _____ R _____

Left Ovary (mm): L _____ W _____

Right Ovary (mm): L _____ W _____

Placental Scars L _____ R _____

Embryos (no.) L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	59.9 g *	
Spleen	.651 g	
Adrenal	L .184 R .087	→ hacked during proximal dissection
Kidney	L 3.20 R 3.16 *	
Thymus	.453	
_____	_____	Tw 1111.8

1264 1051.4 199.6 125.8

(over) (front)

* weight taken from LSK data sheet
liver shrivelled or in ziploc decomposed with alot of liquid

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	(Adult) (circle one)	1yr old ?
Age Based on Body Size:	Juvenile	Subadult	(Adult) (circle one)	
Age Based on Pelage:	Juvenile	Subadult	Adult (circle one)	

Comments:

Stomach contents 70.60 g yellowish white + green fibrous material - looks like tubers

intestine contents 81.60 g - dark gray

lower left jaw wt 5.498

+/- fill fat 31.40

Worksheet:

Total fresh wt 1264 g (DNF)
Carcass wt 893.7
Liver wt 59.9 g (DNF) total liver wt 60.5 g
Kidney wt 4/18 6.3 g (DNF) total kidney wt 7.3 g

(over)

Location No. 012794DD010206 MR Sample No. 012997-952

Site Name Kalamazoo River Otsego Dam

Collector M. Lee Harris Date Collected 1/27/94

Processor Rich Hemy Date Processed 1/29/94

Trap Type 1.5 Double Coil Foothold Live (Dead) (circle one)

Genus/Species Ondatra zibethicus

Total(mm) 530 Tail (mm) 230.5 Hind Foot (mm) 74 (c.44) Ear (mm) _____

Weight(g) w/o pelt 837.1 Carcass* 685.8g Pelt 152.9 Partial Whole (circle one)

Ectoparasites: (Y) N sucking mites Saved Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

* includes colon, jaw, stomach, etc

Male

Testicle Wt (g): L _____ R _____

L Testicle (mm): L _____ W _____

R Testicle (mm): L _____ W _____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Ovary Weight (g): L 0.092 R 0.080

Left Ovary (mm): L 118 W 73

Right Ovary (mm): L 108 W 71

Placental Scars L None R _____

Embryos (no.) L N/A R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) 0.728 w/o Ovaries (g) 0.556

ORGAN	WEIGHT (g)	COMMENTS
Liver	29.947	
Spleen	0.433	
Adrenal	L 0.129 R 0.112	
Kidney	L 2.907 R 1.740	3.04
Thymus	0.221	
_____	_____	tw 955.49

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs: Juvenile Subadult Adult (circle one)

Age Based on Body Size: Juvenile Subadult Adult (circle one)

Age Based on Pelage: Juvenile Subadult Adult (circle one)

Comments:

Total fresh wt 1037 g (DNR)
Carcass wt 598.84 g
Liver wt 29.947 g total liver wt 30.447 g
Kidney wt 4.65 g total kidney wt 5.95 g

Worksheet:

Stomach wt 7.81
Stomach contents wt 18.74 g
Colon wt 93.34 g
Colon contents wt 62.77
Empty colon wt ~~4.65~~ RN 30.57
Sm. Intestine wt 4.65 g
Lower jaw wt 5.449
Pelt wt (before scraping) 194.9 (cons)
Wt of scrap adh material 39.99
152.9

Location No. 0127940D14 0204 MR Sample No. 012994-980

Site Name Kalamazoo River

Collector Mike Harris Date Collected 1/27/94

Processor Matt Donohue Date Processed 1/29/94

Trap Type 1.5 double coil leghold Live (Dead) (circle one)

Genus/Species Ondatra zibethica

Total(mm) 575 Tail (mm) 250 Hind Foot (mm) 73 Ear (mm) _____

Weight(g) w/ pelt-1128.2 w/o pelt, liver, kidneys, lower left jaw, stomach and colon contents- 939.4 Partial Whole (circle one)

Ectoparasites: (Y) N Sucking mites (Saved) Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L 3.00g R 3.10g

L Testicle (mm): L 27 W 19

R Testicle (mm): L 26 W 21

Seminal Vesicle: Small (Large) (circle one)

Epididymis: (Conv.) Not Conv. (circle one)

Female

Ovary Weight (g): L _____ R _____

Left Ovary (mm): L _____ W _____

Right Ovary (mm): L _____ W _____

Placental Scars L _____ R _____

Embryos (no.) L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	16.609	Histo section removed prior to weighing
Spleen	0.40	
Adrenal	L .155 R .118	
Kidney	L 4.150 R 2.481	Right kidney section removed prior to weighing 4.1781
Thymus	.332	
_____	_____	Tot 1370.56

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs: Juvenile Subadult **Adult** (circle one)

Age Based on Body Size: Juvenile Subadult **Adult** (circle one)

Age Based on Pelage: Juvenile Subadult Adult (circle one)

Comments: Organs smell and appear slightly decomposed

Total fresh wt 1496 g
Carcass wt 939.4 g
Liver wt 46.61 g total liver = 47.31
Kidney wt 6.63 g total kidney = 8.63 g

Worksheet:

weight of Stomach - 27.09g
weight of Stomach contents - 16.17g - grainy, dry, yellow with areas of grey

weight of Colon - 117.30g
weight of colon contents 89.27g
weight of empty colon 28.03g

weight of small intenstines 36.03g

weight of left lower jaw - 4.65g

weight of pelt before scraping = 340.1g
weight of scraped material -93.45g + 27.20 = 120.65g
weight of pelt after scraping _____

Location No. 012694 CD RB 17 01 MR Sample No. C1294-953

Site Name KALAMAZOO RIVER

Collector MIKE HARRIS (MICHIGAN DNR) Date Collected 11/26/94

Processor PAUL BOVITZ Date Processed 11/31/94

Trap Type 1.5 LONGSPRING Live (Dead) (circle one)

Genus/Species ONDATRA ZIBETHICUS

Total(mm) 600mm Tail (mm) 248 mm Hind Foot (mm) 79 mm Ear (mm) NR

Weight(g) TOTAL 1475g, wt. w/o ~~fat~~ PB pect mnk, w/o liver + kidneys = 1121.1g Partial Whole (circle one)

Ectoparasites: Y (N) Saved Discarded (circle one)

Endoparasites: Y (N) Saved Discarded (circle one)

Male

Testicle Wt (g): L____ R____

L Testicle (mm): L NA W____

R Testicle (mm): L____ W____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Ovary Weight (g): L 0.114 R 0.087

Left Ovary (mm): L ~~10~~ RB 16 mm W 7 mm

Right Ovary (mm): L 9 mm W 5 mm

Placental Scars L____ R none

Embryos (no.) L____ R none (if present, use worksheet on back to record metrics)

Mammaries: Small Large/Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged NR (circle one)

Repr. Stage: Nulli/Semi Multi (circle one)

Uterus w/ Ovaries (g) 3.80g including fat w/o Ovaries (g) Subtract from above 1.05g w/o fat.

ORGAN	WEIGHT (g)	COMMENTS
Liver	61.5g	showed up frozen, very liquidy ⇒ reweighed: 44.77
Spleen	1.120 g	
Adrenal	L 0.259g R 0.189g	
Kidney	L 3.5g R 3.2g	3.088 LEFT
reweighed:	1.688* 5.084 g	
Thymus		
→	1.389 g	thymus extended well under heart

7u 1310

(over)

*section removed

ARRIVED FROZEN

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	(Adult)	(circle one)	— large thymus
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)	no intermuscars
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)	1yr old animal?

Comments:

Stomach contents 25.5 g yellowish-green fibrous (tubers?)
Colon/caecum contents 139.5 g.
lower left jaw. 5.8g
pelt fat: 76.25 g

Worksheet:

	~~DNR~~ PB	
Total fresh wt	1475 g (DNR)	
Carcass wt	975.8 g	
Liver wt	61.5 g	total liver 63 g
Kidney wt	4.77 g	total kidney 6.17 g

(over)

Location No. 012694 0D040103 Sample No. 012994-985

Site Name Kalamazoo River

Collector Mike Harris (MDNR) Date Collected 1/26/94

Processor Matthew Donohue Date Processed 1/31/94

Trap Type 1.5 Double coil Live (Dead) (circle one)

Genus/Species Ondatra zibethica

Total(mm) 593mm Tail (mm) 248 Hind Foot (mm) 78 Ear (mm) N/A
w/c pelt - 1027.2g

Weight(g) w/o pelt, liver, kidney, stomach contents Partial Whole (circle one)
Caecal contents, left lower jaw - 757.9g

Ectoparasites: Y N _____ Saved Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L 0.773 R 0.803

L Testicle (mm): L 19 W 12

R Testicle (mm): L 19 W 12

Seminal Vesicle: (Small) Large (circle one)

Epididymis: Conv. (Not Conv.) (circle one)

Female

Ovary Weight (g): L _____ R _____

Left Ovary (mm): L _____ W _____

Right Ovary (mm): L _____ W _____

Placental Scars L _____ R _____

Embryos (no.) L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	30.536g	liver section removed for histo prior to weighing
Spleen	.426	
Adrenal	L .111 R —	Right adrenal missing
Kidney	L 3.004 R 1.4419	1/2 of r. kidney removed for histo prior to weighing 2.849
Thymus	.155 (MD) .182	
		Tw 055.1

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	(Subadult)	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments: Carcass and organs smell and appear slightly decomposed.

Worksheet:

Stomach contents - 46.10g 1/2 greyish, finely grained, loose 1/2 yellowish green, finely grained, & dry

Colon + Cecum contents - 138.8g

Lower left jaw - 5.06 g

pelt fat - 28.25g

Total fresh wt.	757.9 g	
Carcass wt	1240 g	
Liver wt	30.536 g	(over) total liver 31.336
Kidney wt.	4.453 g	total kidney 5.853 g

Location No. 012694 0D020103 MR Sample No. C-12994-984

Site Name *Kalamazoo River

Collector Mike Harris Date Collected 1/26/94

Processor Jackie Marrone Date Processed 1/31/94

Trap Type 1.5 Double Coil Live (Dead) (circle one)

Genus/Species Muskrat

Total(mm) 460mm Tail (mm) 128 mm Hind Foot (mm) 74mm Ear (mm) ~

Weight(g) total 1314g; w/o Pel, Liver, Kidney 994.6g (Right) *944.05 Partial Whole (circle one)

Lower jaw; Sm abscess

Ectoparasites: Y (N) Colon Contents Saved Discarded (circle one)

Endoparasites: Y (N) Saved Discarded (circle one)

Male

Testicle Wt (g): L 1.65g R 1.70

L Testicle (mm): L 23mm W 13mm

R Testicle (mm): L 25mm W 14mm

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Ovary Weight (g): L_____ R_____

Left Ovary (mm): L_____ W_____

Right Ovary (mm): L_____ W_____

Placental Scars L_____ R_____

Embryos (no.) L_____ R_____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one) C.

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	35.0 ~~50.5~~ g	Showed up frozen, very liquidy → weighed: 35.0
Spleen	2.75g	
Adrenal	L 0.20g R 0.15g	
Kidney	L 2.5 ~~g~~ R 4.2g	4.5 LEFT
Thymus	0.25	very much reduced.
		TW 1143.2

(over)

* section removed.

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs: Juvenile Subadult Adult (circle one)

Age Based on Body Size: Juvenile Subadult Adult (circle one)

Age Based on Pelage: Juvenile Subadult Adult (circle one)

Comments: ARRIVED FROZEN

stomach contents: 9.2g · yellow/green/brown color; flocculent
color/ caecum contents: 111.6 g dark brown
lower left jaw: 5.54 g
Pelt fat: 31.95 g

Small ~~hooks~~ of Decomposing.

Worksheet:

Total fresh wt. 1314 g (BNR)
Carcass wt. 844.05
Liver wt 35.0 g total liver wt = 35.4 g
Kidney wt. 6.7 g total kidney = 8.7 g

(over)

Location No. 021594TB160201 mR Sample No. 021794-029

Site Name Kalamazoo River

Collector Mike Harris-(CDM) Date Collected 2/15/94

Processor Matt Donohue Date Processed 2/15/17/94 MD

Trap Type 1.5 double coil foot hold Live Dead (circle one)

Genus/Species Ondatra zibethica

Total(mm) 551 Tail (mm) 244 Hind Foot (mm) 71 Ear (mm) —

Weight(g) w/o Pelt - ~~930.4~~ 928.3g Partial Whole (circle one)
w/o pelt, lower jaw, liver, kidneys, lower left jaw, Stomach Contents, colon contents - 733.1

Ectoparasites: Y N _____ Saved Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L 3.01 R 2.99

L Testicle (mm): L 25 W 17

R Testicle (mm): L 26 W 17

Seminal Vesicle: Small (Large) (circle one)

Epididymis: (Conv) Not Conv. (circle one)

Female

Ovary Weight (g): L _____ R _____

Left Ovary (mm): L _____ W _____

Right Ovary (mm): L _____ W _____

Placental Scars L _____ R _____

Embryos (no.) L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	33.38	
Spleen	40	
Adrenal	L 0.09 R 0.04	Right adrenal damaged (part missing)
Kidney	L 3.08 R 1.97	2.87
Thymus		Thymus destroyed when head was severed
		Tw 1002.5

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	(Adult) (circle one)
Age Based on Body Size:	Juvenile	Subadult	(Adult) (circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult (circle one)

Comments: Animal recieved with head separated from body

Worksheet: weight of Stomach contents - 58.93g greyish brown with white ~~flecks~~ flecks wet but not loose coarse, grainy

Colon contents: 101.57g

weight of left lower jaw - 4.51g

Pelt fat - 43.07g

Total fresh wt. 1163 g

Carcass Wt. 733.1 g

Liver wt. 33.38 g total liver (over) 34.08g

Kidney wt 5.05 g total kidney 5.95 g

Location No. 021594TB060202 MR Sample No. 021794-030

Site Name Kalamazoo River

Collector Mike Harris Date Collected 2/15/94

Processor Matt Donohue Date Processed 2/17/94

Trap Type 110 Conibear Live (Dead) (circle one)

Genus/Species Ondatra zibethica

Total(mm) 545 Tail (mm) 225 Hind Foot (mm) 69 Ear (mm) —

Weight(g) w/o Pelt - 816.3g
w/o Pelt, left lowerjaw, kidneys, liver, stomach contents + Colon contents - 663.9g Partial Whole (circle one)

Ectoparasites: Y N _____ Saved Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L_____ R_____

L Testicle (mm): L_____ W_____

R Testicle (mm): L_____ W_____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Ovary Weight (g): L .09 R .08

Left Ovary (mm): L 10 W 7

Right Ovary (mm): L 11 W 7

Placental Scars L_____ R_____

Embryos (no.) L_____ R_____ (if present, use worksheet on back to record metrics)

Mammaries: (Small) Large Lactating (circle one)

Vagina: (Inactive) Cornified Turgid Plugged (circle one)

Repr. Stage: (Nulli) Semi Multi (circle one)

Uterus w/ Ovaries (g) .44 w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	23.80	Section of liver removed for Histo
Spleen	.39	
Adrenal	L .09 R .11	
Kidney	L 2.45 R 1.20	½ of Right Kidney removed for Histo. 2.4
Thymus	.15g	Thymus appears slightly decomposed
		w 883.33

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	(Subadult)	Adult	(circle one)
Age Based on Body Size:	Juvenile	(Subadult)	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments: ① Animal smells slightly decomposed

② Longs have white spots throughout them

③ Stomach has brown, smooth path on inside, approx 1/5 surface area in size.

Worksheet: weight of Stomach contents - 21.91 g greyish-yellow, grainy, dry

Colon + Cecum contents - 84.76 g

Left lower Jaw 4.83 g

Pelt fct - 18.92 g

Total fresh wt 990 g

Carcass wt 663.9 g

Liver wt 23.80 g total liver 24.6 g

Kidney wt 3.65 g total kidney 4.85 g

(over)

Location No. TB320303MR Sample No. (CAT) 021694 TB320303MR

Site Name KALAMAZOO RIVER

Collector MIKE HARRIS (MICHIGAN DNR) Date Collected 2-16-94

Processor P. BOVITZ Date Processed 2-17-94

Trap Type DOUBLE COIL Live (Dead) (circle one)

Genus/Species ONDATRA ZIBETHICUS

Total(mm) 511 Tail (mm) 252 Hind Foot (mm) 72 Ear (mm) —

Weight(g) carcass 610 g. + liver 28.37g + pelt w/o liver+kidney) + kidneys 4.23 g Partial Whole (circle one)

Ectoparasites: (Y) ~~(N)~~ Saved Discarded (circle one)

Endoparasites: ~~(Y)~~ (N) TNC Mites Saved Discarded (circle one)

Male

Testicle Wt (g): L ____ R NA

L Testicle (mm): L ____ W ____

R Testicle (mm): L ____ W ____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Ovary Weight (g): L .06 R .05 g

Left Ovary (mm): L 10 mm W 6 mm / ~~10 mm~~ PB

Right Ovary (mm): L 10 mm W 6 mm

Placental Scars L ____ R ____

Embryos (no.) L ____ R ____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) ____ w/o Ovaries (g) ____

Right ovary apparently PB degenerative - no fat around ~~it~~ - extensive fat on left ovary

both not well developed no fat - young ♀

ORGAN	WEIGHT (g)	COMMENTS
Liver	28.37 g	
Spleen	0.33 g	
Adrenal	L 0.21 g R 0.19 g	
Kidney	L 2.91 g R 1.32 g	2.92
Thymus	none found	
uterus w/ovaries	1.04 g	TW 735.2L

(over)

Animal smells as if decomposing badly. Young animal -

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments:

Stomach contents - empty (rinsed with DI)

Colon contents 64.74 g

Lower right jaw 4.22 g

pelt scrapings 6.28 g

pelt 121.5 g

Worksheet:

Total fresh wt 800 g
Carcass wt 541.04 g
Liver wt 28.37 g total liver 29.17 g
Kidney wt 4.23 g total kidney 5.83 g

(over)

Location No. 021694TB110301MK Sample No. 021794-25

Site Name Kalamazoo River

Collector Mike Harris (CDM) Date Collected 2-16-94

Processor Matt Donahue Date Processed 2-17-94

Trap Type 110 Conibear Live (Dead) (circle one)

Genus/Species Mustela vison

Total(mm) 512 Tail (mm) 171 Hind Foot (mm) 26 Ear (mm) —

Weight(g) w/o pelt, liver, kidneys, stomach contents, colon contents, lower jaw - 470.26 Partial Whole (circle one)
w/o pelt - 517.6

Ectoparasites: Y N _____ Saved Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L _____ R _____

L Testicle (mm): L _____ W _____

R Testicle (mm): L _____ W _____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Ovary Weight (g): L .06 R ~~.05~~ .06

Left Ovary (mm): L 9 W 5

Right Ovary (mm): L 8 W 5

Placental Scars L None R None

Embryos (no.) L None R None (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) — w/o Ovaries (g) .80

ORGAN	WEIGHT (g)	COMMENTS
Liver	34.43	
Spleen	226 g	dark spots (possibly lesions) on Spleen
Adrenal	L .04 R .04	Adrenals yellow~~ish~~ in color
Kidney	L 2.87 R 1.67	½ of right kidney removed for Histo 2.67
Thymus	.38	

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments:

Worksheet: Stomach contents - No contents

Colon contents - No contents

Lower jaw - 4.21g

Pelt fat - 20.10

Total fresh wt 686 g

Carcass wt 470.2 g

Liver wt 34.43 g total liver = 35.03 g

Kidney wt 4.54 g total kidney = (over) 5.54 g

Location No. C21C94TB250305MR Sample No. 24476

Site Name Kalamazoo River

Collector Mike Harris (CDM) Date Collected 2/11/94

Processor Phil Kim (REAC) Date Processed 2/17/94

Trap Type 1.5 Double Coil (Foot Hold) Live (Dead) (circle one)

Genus/Species Ondatra zibethica

Total(mm) 513 Tail (mm) 225 Hind Foot (mm) 68 Ear (mm) —

Weight(g) w/o Liver and Pelt : 711.1g kidneys (Partial) Whole (circle one)

Ectoparasites: (Y) (N) Mites Saved Discarded (circle one)

Endoparasites: (Y) N preserved in formalin (Saved) Discarded (circle one)

Male

Testicle Wt (g): L 0.20 R 0.20

L Testicle (mm): L 10 W 6

R Testicle (mm): L 10 W 6

Seminal Vesicle: (Small) Large (circle one)

Epididymis: Conv. (Not Conv) (circle one)

Female

Ovary Weight (g): L _____ R _____

Left Ovary (mm): L _____ W _____

Right Ovary (mm): L _____ W _____

Placental Scars L _____ R _____

Embryos (no.) L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	39.50	
Spleen	0.48	
Adrenal	L 0.10 R 0.12	
Kidney	L 3.58 R 2.23	Right kidney partial 3.43
Thymus	0.26	
		Tc 772.57

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments:

Worksheet:

Stomach Contents : 37.81g

Colon contents : 83.62g

Pelt. 102.9g
(after scraping)

Pelt scrapings : 7.73g

Total fresh wt 894 g (DNR)

Carcass wt 589.67 g

Liver wt 39.50 g total liver 40.2 g

Kidney wt 5.81 g total kidneys 7.01 g

(over)

Location No. 021694 TB 290304 MR Sample No. _____

Site Name KALAMAZOO RIVER

Collector M. HARRIS Date Collected 2/16/94

Processor P. BOVITZ Date Processed 2/17/94

Trap Type 110 CON. BEAR Live (Dead) (circle one)

Genus/Species ONDATRA ZIBETHICUS

Total(mm) 511 Tail (mm) 213 Hind Foot (mm) 65 mm Ear (mm) _____

Weight(g) 548.5 g (carcass w/o liver, kidney, pelt) Partial Whole (circle one)

Ectoparasites: (Y) N TNC mite (Saved) Discarded (circle one)

Endoparasites: Y (N) Saved Discarded (circle one)

Male

Testicle Wt (g): L .39 g R .40 g

L Testicle (mm): L 13 W 9

R Testicle (mm): L 13 W 8 mm

Seminal Vesicle: ~~Small~~ Large (circle one)

Epididymis: Conv. (Not Conv) (circle one)

Female

Ovary Weight (g): L _____ R _____

Left Ovary (mm): L _____ W _____ NA

Right Ovary (mm): L _____ W _____

Placental Scars L _____ R _____

Embryos (no.) L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	32.89 g	
Spleen	1.18 g	
Adrenal	L .11 R .06	
Kidney	L 3.11 R ~~3~~ (2) 1.68	Right Kidney partial 3.08
Thymus	0.13 g	
_____	_____	Tw 774.3

(over)

Smells as if decomposed

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	(Juvenile)	Subadult	Adult	(circle one)
Age Based on Body Size:	(Juvenile)	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments:

Stomach contents: 28.3 g

colon contents: 106.4 g

lower left jaw: 4.23 g

Pelt after scraping: 85.8 g

Pelt scrapings: 10.25 g

Worksheet:

Total fresh wt 909 g (DNR)

Carcass wt 548.5 g

Liver wt 32.89 g total liver 33.79 g

Kidney wt. 4.79 g total kidney 6.19 g

(over)

Location No. 021794TB110402MK Sample No. _____

Site Name ~~Kalamazoo River Trail Bridge~~ 2US

Collector Mike Harris Date Collected 2/17/94

Processor Jackie Marrone Date Processed 2/18/94

Trap Type TB-HD 1.5 Double Coil Foothold Live (Dead) (circle one)

Genus/Species MINK

Total(mm) 615 Tail (mm) 240 Hind Foot (mm) 103 (Rt) Ear (mm) _____

Weight(g) field total: 1410.9 in Bag, Liver, Kidney - 990.3 Partial (Whole) (circle one)

Ectoparasites: Y N _____ Saved Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L 3.00 g R 3.25 g

L Testicle (mm): L ~~3.5~~ 3.25 W ~~2~~ 2.20

R Testicle (mm): L ~~3.5~~ 3.35 W ~~2.25~~ 2.35

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Ovary Weight (g): L _____ R _____

Left Ovary (mm): L _____ W _____

Right Ovary (mm): L _____ W _____

Placental Scars L _____ R _____

Embryos (no.) L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	field - 78.80 lab - 59.60	
Spleen	4.05	~~enlarged~~
Adrenal	L 0.05 R 0.05	
Kidney	L 2.25 R 5.50	~~Lft~~ L: 1mm W: 2.25mm ~~Rt~~ L: 3.5mm W: 2mm 4.85
Thymus	0.55	
_____	_____	Tw 1395.3

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments:

Stomach Contents: ~~1~~ g nothing in stomach

Colon Contents: 10.7 g yellow, green color - (Blood is from colon exterior)

Lower Lft. Jaw. 5.3 g

Pelt - 308.1 g

Pelt Scraping 32.95 g

Worksheet:

	RSAC	DNR
Total Fresh wt		1406 g
Carcass wt	990.3	
Liver wt	59.60	total liver 60.4 g
Kidney wt	7.75	total kidney 10.35 g

(over)

Location No. 021794TB160406MR Sample No. _____

Site Name KALAMAZOO RIVER

Collector M. HARRIS (DNR) Date Collected 2/17/94

Processor P. BOVITZ Date Processed 2/18/94

Trap Type 110 CONIBEAR Live (Dead) (circle one)

Genus/Species Ondatra zibethicus

Total(mm) 560 MM Tail (mm) 240 mm Hind Foot (mm) 70 mm Ear (mm) —

Weight(g) 1400 (original), carcass 1053.5g pelt-259.2g, liver 51.3g Partial Whole (circle one)

Ectoparasites: (Y) N TNC Saved Discarded (circle one)

Endoparasites: Y (N) _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L 2.85 R 2.90 g

L Testicle (mm): L 26 PB 3 mm W 18 mm

R Testicle (mm): L 26mm W 19mm

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Ovary Weight (g): L _____ R _____ NA

Left Ovary (mm): L _____ W _____

Right Ovary (mm): L _____ W _____

Placental Scars L _____ R _____

Embryos (no.) L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	51.3g (loss of blood)	
Spleen	.76 g	
Adrenal	L 0.10g R Missing	
Kidney	L 3.01g R 5.05g	tremendous amount of fat around testes 5.21
Thymus	1.20 g	
_____	_____	T.W. 1269.7

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments:

stomach contents - yellowish green + gray fibrous material 28.1 g

colon contents 102.2 g

left lower jaw 4.95 g

pelt scrapings 69.5 g

Worksheet

Total fresh wt 1400 g

Carcass wt 1053 g

Liver wt 8.06 g total liver 52 g

Kidney wt 5.13 g total kidneys 10.26 g

(over)

Location No. 031494PDKZ01MR KEHC# Sample No. 031594-147

Site Name Kalamazoo River Date Collected 3-14-94

Collector Michael Harris

Processor Jackie Marrone Date Processed 3-15-94

Trap Type 1.5 long spring foot hold Live (Dead) (circle one)

Genus _____ Species Muskrat

Total(mm) 562 mm Tail 248 mm Hind Foot (R) 81 mm Ear _____

field - 1220g w/o pelt, liver, kidney, stomach + Colon Contents

Weight(g) w/o pelt, liver, kidney - 910.7g Partial (Whole) (circle one) lower left jaw 873a

Ectoparasites: (Y) N mites - FNTC (Saved) Discarded (circle one) in alcohol

Endoparasites: Y (N) Saved Discarded (circle one)

Male

L Testicle: L 2.4 mm W 1.9 mm

R Testicle: L 2.4 mm W 2 mm

Testicle Wt: L 3.316 R 3.289 g C _____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Left Ovary L _____ W _____

Right Ovary L _____ W _____

Ovary Weight L _____ R _____ C _____ g

Placental Scars L _____ R _____

Embryos L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries _____ w/o Ovaries _____

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver	47.770g	Y N	_____	field: 54g Histo 0.7g ; 0.5g
Spleen	0.600g	Y N	_____	
Adrenal	(R) 0.19 (L) 0.15	Y N	_____	
Kidney	(R) 2.405 (L) 1.944	Y N	_____	field (R) 4.2g (L) 4.4g ; Histo: 1.9g 4.305
Thymus	—	Y N	_____	thymus amorphous
_____	_____	Y N	_____	
_____	_____	Y N	_____	
_____	_____	Y N	_____	Tiss ID 82-2

(over)

Dorsal Pelage Color _____ Ventral Pelage_____ Side Pelage_____

Age Based on Sex Organs: Juvenile Subadult Adult (circle one)

Age Based on Body Size: Juvenile Subadult Adult (circle one)

Age Based on Pelage: Juvenile Subadult Adult (circle one)

Comments:

Stomach contents: 36.80 wt dark green, roughage

Colon contents: 10100 wt - dark brown/green

lower Rt jaw 1.30 wt

pelt 188.30 wt - fat removed from pelt 116.90

Worksheet:

Total fresh wt	1220 g	
Carcass wt	873 g	
Liver wt	47.77 g	total liver 48.97 g
Kidney wt	6.85 g	total kidney 8.75 g

Location No. 031494PD220202MR (REAC) Sample No. 031594-148

Site Name KALAMAZOO RIVER Date Collected 3/14/94

Collector MICHAEL HARRIS

Processor PHIL KIM Date Processed 3/15/94

Trap Type 1.5 DOUBLE COIL FOOT HOOP Live (Dead) (circle one)

Genus ONDATRA ZIBETHICUS Species _____

Total(mm) 512 Tail 207 Hind Foot 69 Ear ———

Weight(g) 724.5 (w/o kidney, liver, pelt) 611.0 (w/o LIVER, KIDNEY, PELT, JAW, EGG CONTENTS) Partial Whole (circle one)

Ectoparasites: (Y) N MITES - TNTC (Saved) Discarded (circle one)

Endoparasites: Y (N) _____ Saved Discarded (circle one)

Male

L Testicle: L _____ W _____

R Testicle: L _____ W _____

Testicle Wt: L _____ R _____ C _____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Left Ovary L 8mm W 5mm

Right Ovary L 8mm W 5mm

Ovary Weight L .058 R .060 C _____

Placental Scars L 0 R 0

Embryos L 0 R 0 (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries _____ w/o Ovaries 1.109

ORGAN	WEIGHT	HISTO	PRESERV.	COMMENTS
Liver	26.396	Y N		PARTIAL
Spleen	.736	Y N		
Adrenal	L .194 R .154	Y N		
Kidney	L 1.870 R 2.767	Y N		LEFT KIDNEY PARTIAL 3.667
Thymus	.111	Y N		
		Y N		
		Y N		
		Y N		jw 813 22

(over)

Dorsal Pelage Color Med brn Ventral Pelage Lt. brn Side Pelage Buff & grey

Age Based on Sex Organs:	Juvenile	(Subadult)	Adult	(circle one)
Age Based on Body Size:	Juvenile	(Subadult)	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments:

Worksheet:

STOMACID CONTENTS	10.150
COLON CONTENTS	80.633
LOWER JAW	4.417
PELT SCRAPPINGS	18.350

Total fresh wt	704 g	
Carcass wt.	611 g	
Liver wt.	26.40 g	total liver 27.3 g
Kidney wt.	4.64 g	total ~~liver~~ kidneys 5.54 g

031544-150

Location No. 031494 PD 070204 MR Sample No. ~~PD070204MAR~~

Site Name KAL RIV

Collector MICHAEL HARRIS Date Collected 3/14/94

Processor SHERRY BUTTERS Date Processed 3/16/94

Trap Type 110 CONIBEAR Live (Dead) (circle one)

Genus/Species ONDATRA ZIBETHICA

Total(mm) 446 Tail (mm) 204 Hind Foot (mm) 69 Ear (mm) ——

Weight(g) w/o pelt 748.9 / 640.4 w/o PELT LIVER KIDNEYS colon & STOMACH CONTENTS, & LOWER JAW Partial Whole (circle one)

Ectoparasites: Y N _____ Saved Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L 2.287 R 2.288

L Testicle (mm): L 21 W 16

R Testicle (mm): L 22 W 17

Seminal Vesicle: Small (Large) (circle one)

Epididymis: (Conv.) Not Conv. (circle one)

Female

Ovary Weight (g): L_____ R_____

Left Ovary (mm): L_____ W_____

Right Ovary (mm): L_____ W_____

Placental Scars L_____ R_____

Embryos (no.) L_____ R_____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	24.092	HISTO SAMPLE ~~SAMPLE~~ TAKEN PRIOR TO WEIGHING
Spleen	.603	
Adrenal	L .120 R .104 ~~.125~~	
Kidney	L 2.709 R 1.537	2.77 HISTO SAMPLE TAKEN FROM RIGHT KIDNEY PRIOR TO WEIGHING.
Thymus	.418	
_____	_____	TW 846.13

(over)

Dorsal Pelage Color BROWN Ventral Pelage Color LT BROWN Side Pelage Color GRAY

Age Based on Sex Organs:	Juvenile	Subadult	(Adult)	(circle one)
Age Based on Body Size:	Juvenile	Subadult	(Adult)	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments:

COLON CONTENTS 55.540

STOMACH CONTENTS 7.330

LOWER JAW 3.545

PELT SCRAPPINGS 16.31

Worksheet:

Total fresh wt 909 g

~~Ff~~ LB Carcass wt 640.4 g

Liver wt. 24.09 g total liver 24.79 g

Kidney wt. 4.26 7 LB g total kidney 5.47 g

(over)

Location No. 031494PD110206me Sample No. 031594-152

Site Name Kalamazoo River

Collector Michael Harris Date Collected 3-14-94

Processor Jackie Marrone Date Processed 3-16-94

Trap Type 1.5 Double Coil foot hold Live (Dead) (circle one)

Genus/Species Muskrat

Total(mm) 550mm Tail (mm) 225mm Hind Foot (mm) (R) 73mm Ear (mm) –

Weight(g) field - 130.69 w/o Liver, Kidneys, Pelt: 999.6g w/o Liver, kidneys, pelt, colon contents, stomach contents 850.7 Partial (Whole) (circle one)

Ectoparasites: (Y) N mites - TNTC (Saved) Discarded (circle one) in alcohol (field

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L 2.236 R 2.340

L Testicle (mm): L 22 W 16

R Testicle (mm): L 25 W 18

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Ovary Weight (g): L_____ R_____

Left Ovary (mm): L_____ W_____

Right Ovary (mm): L_____ W_____

Placental Scars L_____ R_____

Embryos (no.) L_____ R_____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	33.240	field wt 42.7g, thsts 0.29 0.44g
Spleen	0.~~578~~ 538	
Adrenal	L 0.140 R 0.119	
Kidney	L 3.624 R 2.~~484~~ 24	field (L) 4.9g (R) 5.2g thsts = 1.8g 4.221
Thymus	0.533	damaged.
_____	_____	Tw 1186.2

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments:

Stomach contents - 24.7 g fiberous, yellow/green in color

Colon contents - 95.1 g - Dark grey in color.

Pelt scrapings 46.75 g ~~Pelt wt _____ g~~

Lower left jaw - 4.80 g

Worksheet:

total fresh wt	1306 g	
Carcass wt.	850.7 g	
liver wt.	33.24 g	total liver 33.84 g
kidney wt.	6.05 g	total kidneys 7.85 g

(over)

Location No. 031494PD180203MR Sample No. 031594-149

Site Name Kalamazoo River

Collector Mike Harris Date Collected 03-14-94

Processor Matt Donahue Date Processed 03-16-94

Trap Type 1.5 long spring foot hold Live (Dead) (circle one)

Genus/Species Ondatra zibethicc

Total(mm) 494 Tail (mm) 195 Hind Foot (mm) 73 Ear (mm) —

w/o Pelt - 921.1

Weight(g) w/o pelt, liver, kidneys, colon contents, stomach contents, lower left jaw - 768.3g Partial Whole (circle one)

Ectoparasites: Y N _____ Saved Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

~~Male~~

~~Testicle Wt (g): L_____ R_____~~

~~L Testicle (mm): L_____ W_____~~

~~R Testicle (mm): L_____ W_____~~

~~Seminal Vesicle: Small Large (circle one)~~

~~Epididymis: Conv. Not Conv. (circle one)~~

Female

Ovary Weight (g): L 0.077g R 0.105

Left Ovary (mm): L 11 W 6

Right Ovary (mm): L 11 W 7

Placental Scars L — R —

Embryos (no.) L — R — (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) 2.01g w/o Ovaries (g) 1.90

ORGAN	WEIGHT (g)	COMMENTS
Liver	29.92	Section of liver removed for histo prior to weighing
Spleen	0.448	
Adrenal	L 0.124 R 0.139	
Kidney	L 2.97 R 1.669	1/2 of rt. kidney removed for histo prior to weighing 2.96
Thymus	0.214	
		Tw: 996.3

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	**Adult** (circle one)
Age Based on Body Size:	Juvenile	Subadult	**Adult** (circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult (circle one)

Comments:

colon contents- 73.5 g

Stomach contents- 29.2 g - green - morst but not loose appears gritty in consistency with short fibres throughout

Left lower jaw- 5.022 G.

pelt scrapings - 22.26g

Worksheet:

	REAC	DNR
total fresh wt		1099 g
Carcass wt	768.3 g	
liver wt	29.92 g	total liver = 31.12
kidney wt	4.63 g	total kidney = 5.93 g

(over)

Location No. 031494PD240205MR Sample No. 031594-151

Site Name Kalamazoo River

Collector Michael Harris Date Collected 3-14-94

Processor Matt Donohue Date Processed 3-16-94

Trap Type 1.5 Long Spring foot hold Live (Dead) (circle one)

Genus/Species Ondatra zibethica

Total(mm) 441 Tail (mm) 203 Hind Foot (mm) 68 Ear (mm) —

Weight(g) w/o pelt - 825.5g lower; w/o pelt, liver, kidneys, GI contents, stomach contents lower left jaw - 752.8g Partial Whole (circle one)

Ectoparasites: Y N _____ Saved Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L 2.55g R 2.40

L Testicle (mm): L 22 W 16

R Testicle (mm): L 22 W 16

Seminal Vesicle: Small (Large) (circle one)

Epididymis: (Conv.) Not Conv. (circle one)

Female

Ovary Weight (g): L_____ R_____

Left Ovary (mm): L_____ W_____

Right Ovary (mm): L_____ W_____

Placental Scars L_____ R_____

Embryos (no.) L_____ R_____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	(wet) ~~29.28.99~~	~~Liver 50~~ (wet) Histo sample taken prior to weighing
Spleen	1.026	
Adrenal	L 0.034 R 0.057	
Kidney	L 3.57 R 2.05	Histo sample taken from right kidney prior to weighing 3.95
Thymus	0.273g	
_____	_____	Tw 1018.1

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult (circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult (circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult (circle one)

Comments:

Colon contents - 35.8g

Stomach contents - 6.1g - greyish-green, loose, fibrous

Lower left Jaw - 4.15g

weight of pelt scrapings - 32.11g

Worksheet:

	REAC	DNR
total fresh wt		1060 g
Carcass wt	752.8	
liver wt	28.99	total liver 29.69g
Kidney wt	5.62	total kidney 7.52g

(over)

Location No. (PR) 7+ 031994 PD360701MK Sample No. 032294-199

Site Name Kalamazoo River

Collector Mike Harris Date Collected 3/19/94

Processor Phil Kim Date Processed 3/22/94

Trap Type 1.5 long Spring foot hold Live (Dead) (circle one)

Genus/Species Ondatra (PR) Mustela vison

Total(mm) 509 Tail (mm) 172 Hind Foot (mm) 19 Ear (mm) —

Weight(g) 502.0 (w/o liver, kidney, pelt) 421.5 (w/o liver, kidney, pelt, GI contents) (Partial) Whole (circle one)

Ectoparasites: (Y) N Ticks (Saved) Discarded (circle one)

Endoparasites: Y N Saved Discarded (circle one)

Male

Testicle Wt (g): L ____ R ____

L Testicle (mm): L ____ W ____

R Testicle (mm): L ____ W ____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Ovary Weight (g): L 0.088 R 0.106

Left Ovary (mm): L 6 W 5

Right Ovary (mm): L 8 W 6

Placental Scars L — R —

Embryos (no.) L — R — (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified (Turgid) Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) — w/o Ovaries (g) 0.725

ORGAN	WEIGHT (g)	COMMENTS
Liver	[28.851]	Partial
Spleen	2.024	
Adrenal	L 0.126 R 0.088	
Kidney	L 2.820 R [1.691]	Right kidney partial 2.791
Thymus	0.162	
		FC 605.74

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	(Juvenile)	Subadult	Adult	(circle one)
Age Based on Body Size:	(Juvenile)	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments:

Colon contents ~~13.86 g~~ (PI) 5.86 g

Stomach contents 52.4 g.

Pelt scrapings 6.661 g

125.25
111.39
13.86

164.3
112.9
52.4

Worksheet:

	REAC	DNR
total fresh wt		667 g
carcass wt	421.5 g	
liver wt	28.85 g	total liver 29.45g
kidney wt	4.51 g	total kidney 5.61g

(over)

Location No. C330194-A&B 00104MR REAC Sample No. C40194-229

Site Name Kalamazoo River

Collector Mike Harris Date Collected 3/30/94

Processor Phil Kim Date Processed 4/1/94

Trap Type 1.5 Double coil fat held Live (Dead) (circle one)

Genus/Species Odantra tibethica

Total(mm) 544 Tail (mm) 229 Hind Foot (mm) 68 Ear (mm) —

Weight(g) 1015.5 (w/o pelt, liver, kidney) 840.5 (w/o pelt, liver, kidney GI contents, jaw) Partial Whole (circle one)

Ectoparasites: (Y) N Ticks (Saved) Discarded (circle one)

Endoparasites: Y N Saved Discarded (circle one)

Male

Testicle Wt (g): L 2.508 R 2.514

L Testicle (mm): L 23 W 18

R Testicle (mm): L 25 W 16

Seminal Vesicle: Small (Large) (circle one)

Epididymis: (Conv) Not Conv. (circle one)

Female

Ovary Weight (g): L____ R____

Left Ovary (mm): L____ W____

Right Ovary (mm): L____ W____

Placental Scars L____ R____

Embryos (no.) L____ R____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) ____ w/o Ovaries (g) ____

ORGAN	WEIGHT (g)	COMMENTS
Liver	[58.518]	Partial
Spleen	0.719	
Adrenal	L 0.141 R 0.100	
Kidney	L 4.830 R [2.318]	Right kidney partial 4.598
Thymus	0.531	
		Tc: 1149.7

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments:

Face severely lacerated.
Right front leg damaged from trap.

Colon contents - 131.5g
Stomach contents - 23.8g
Pelt scrapings - 28.460g

Worksheet:

DNR
total fresh wt RIAC 1305 g
Carcass wt 840.5 g
liver wt 58.52 g total liver wt 59.92
kidney wt 7.23 g total kidney wt 9.43

(over)

Location No. 033094 AD 240101 MR Sample No. 040194-226

Site Name Kalamazoo River

Collector Mike [redacted]ris Date Collected 03/30/94

Processor Matt Donohue. Date Processed 04/01/94

Trap Type 1.5 Double coil foot hold Live (Dead) (circle one)

Genus/Species Ondatra zibethica

Total(mm) 512 Tail (mm) 213 Hind Foot (mm) 70 Ear (mm) —

Weight(g) w/o Pelt - 861.6g w/o pelt lower left leg, liver, kidneys, colon contents, & stomach contents - 688.6g Partial Whole (circle one)

Ectoparasites: Y N _____ Saved Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L_____ R_____

L Testicle (mm): L_____ W_____

R Testicle (mm): L_____ W_____

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Ovary Weight (g): L 0.062 R 0.085 0.094 (ms)

Left Ovary (mm): L 10 W 7

Right Ovary (mm): L 10 W 6

Placental Scars L_____ R_____

Embryos (no.) L_____ R_____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) 1.323 (ms) g w/o Ovaries (g) 1.03 (ms) g

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ORGAN	WEIGHT (g)	COMMENTS
Liver	49.05	portion of liver removed prior to weighing for Histo
Spleen	0.972	
Adrenal	L 0.239 R 0.178	
Kidney	L 3.83 R 2.14	3.64 1/2 of right kidney removed prior to weighing
Thymus	.230 g	
		Tw 91d.5

(over)

Dorsal Pelage Color _____ Ventral Pelage Color _____ Side Pelage Color _____

Age Based on Sex Organs:	Juvenile	Subadult	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments: Stomach Contents - 26.6 - Greenish grey, firm fibrous

Colon + Cecum contents - 78.9

Lower left jaw - 3.873g

pelt scrapings - 16.22g

Worksheet:

	REAC	DNK	
total fresh wt		1018 g	
Carcass wt.	688.6 g		
liver wt.	49.05	total liver	50.15 g
kidney wt.	5.97	total kidney	7.47g

(over)

Location No. 033094ADC9103MR . Sample No. C40194-325

Site Name Kal River

Collector Mike Harris Date Collected 3-30-94

Processor Jackie Marrone. Date Processed 4-1-94

Trap Type 1.5 Double Coil footHold Live Dead (circle one)

Genus/Species Muskrat

Total(mm) 549mm Tail (mm) 230mm Hind Foot (mm) 67mm Ear (mm) _____

Weight(g) total minus- Kidneys, Liver, pelt - 1030.7g Partial Whole (circle one) total minus Kidneys, Liver, pelt, Stomach Contents, Colon Contents, & Left jaw 931.10 g

Ectoparasites: Y N Mites - TNTC. Saved Discarded (circle one) in alcohol (fluid)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L 2.915 R 2.861

L Testicle (mm): L 26mm W 16mm

R Testicle (mm): L 28mm W 20mm

Seminal Vesicle: Small X Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Seminal Vesicles grossly enlarged
R: 4.629 g
L: 4.628 g

Female

Ovary Weight (g): L _____ R _____

Left Ovary (mm): L _____ W _____

Right Ovary (mm): L _____ W _____

Placental Scars L _____ R _____

Embryos (no.) L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	~~5.975~~ 4.986	portion removed prior for Histo
Spleen	0.750	
Adrenal	L 0.124 R 0.104	4.94
Kidney	L 4.864 R 2.340	1/2 of (R) Kidney removed prior for Histo
Thymus	0.258	
		Tu 1328.95

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult (circle one)	
Age Based on Body Size:	Juvenile	Subadult	Adult (circle one)	fatty tumor on pelt -
Age Based on Pelage:	Juvenile	Subadult	Adult (circle one)	

Comments:

Stomach Contents 8.10 g
Yellow/Green in color
fiberous w/ Liquid

Colon Contents 72.95 g
Brown/Red/Green in color

Lower lft jaw 4.00 g

Pelt Scraping 55.007 g

Stomach lining - part was ~~smooth~~ smooth brown/red & white mottled - rest was normal.

Worksheet:

	(g)	REAC	DNR
total fresh wt			1410 g
carcass wt		931.10 g	
liver wt		54.986	total liver = 55.68 g
kidney wt		7.20	total kidney = 9.8 g

(over)

Location No. 033094AD160102MR Sample No. 040194-227

Site Name Kalamazoo River

Collector Mike Harris Date Collected 3-30-94

Processor Matt Donohue Date Processed 04/01/94

Trap Type 1.5 Dubble coil foot hold Live (Dead) (circle one)

Genus/Species Ondatra zibethica

Total(mm) 448 Tail (mm) 227 Hind Foot (mm) 68 Ear (mm) ———
w/o pelt - ~~443~~ 991.5

Weight(g) w/o pelt liver, kidneys, colon contents, stomach contents, lower left jaw - 846.1 Partial Whole (circle one)

Ectoparasites: Y N ——— Saved Discarded (circle one)

Endoparasites: Y N ——— Saved Discarded (circle one)

Male

Testicle Wt (g): L 2.70 R 2.67

L Testicle (mm): L 23 W 15

R Testicle (mm): L 24 W 15

Seminal Vesicle: Small (X-Large) (circle one)

Epididymis: (Conv.) Not Conv. (circle one)

Seminal vesicle weights
L - 2.12g
R - 1.82g

Female

Ovary Weight (g): L_____ R_____

Left Ovary (mm): L_____ W_____

Right Ovary (mm): L_____ W_____

Placental Scars L_____ R_____

Embryos (no.) L_____ R_____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	44.86	portion of liver removed prior to weighing
Spleen	1.053	
Adrenal	L 0.114 R 0.084	
Kidney	L 3.39 R 2.01	3.81 ½ of right kidney removed prior to weighing
Thymus	0.184	
———	———	Tu 117C.7

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments: Colon contents - 62.9 g

Stomach contents - 7.4g - loose, yellowish-green, fibrous

Lower left jaw - 4.05g

Right rear foot broken - caused by trap

Pelt scrapings - 13.17g

Worksheet:

total fresh wt	R2AC ~~931~~	DNR PB ~~1410~~ g 1241	
Carcass wt	PB ~~931.10~~ 846.1		
liver wt	PB ~~51.99~~ 44.86	total liver	45.56 g
kidney wt.	PB ~~7.20~~ 5.40	total kidney	7.20 g

(over)

Location No. 040494AD500405MR Sample No. 040494-324

Site Name Kal River

Collector Mike Harris Date Collected 4-4-94

Processor Jackie Marrone Date Processed 4-6-94

Trap Type 1.5 Double Coil Foot Hold Live (Dead) (circle one)

Genus/Species Muskrat

Total(mm) 531 mm Tail (mm) 217 mm Hind Foot (mm) (Rt) 71mm Ear (mm) N/A

Weight(g) field = 1201g w/o Liver & Kidneys: 914.5g / w/o Liver, Kidney, Lower Lft Jaw, Stomach & Colon Contents & Pelt 777

Partial Whole (circle one)

Ectoparasites: (Y) N mites - (TNTC) (Saved) Discarded (circle one) in field / in alcohol

Endoparasites: Y (N) Saved Discarded (circle one)

Male

Testicle Wt (g): L 3.011g R 2.991g

L Testicle (mm): L 25mm W 18mm

R Testicle (mm): L 23mm W 20mm

Seminal Vesicle: Small (Large) (circle one)

Epididymis: (Conv.) Not Conv. (circle one)

Female

Ovary Weight (g): L _____ R _____

Left Ovary (mm): L _____ W _____

Right Ovary (mm): L _____ W _____

Placental Scars L _____ R _____

Embryos (no.) L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	55.196g	Section removed in field for Histo
Spleen	0.377	
Adrenal	L 0.109 R 0.088	
Kidney	L 5.016 R 3.436	1/2 of (Rt) Kidney Removed in field for Histo 5.236
Thymus	0.560	
		Tissue 1077.82

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments:

Stomach Contents 24.38 g - Dark green / Brown / Yellow fiberous.

Colon Contents 98.8 g - Brown/Green - fiberous.

Lower Left Jaw 4.429 g.

Pelt Scraping 27.872 g

Worksheet:

	REAC (g) PB	PB DNR
Total fresh weight	~~DNR~~	1201 g
Carcass fresh weight	777.9 (g)	
liver fresh weight	55.196 (g)	→ 56.196 total
kidney fresh weight	8.45 (g)	→ 10.25 g total

(over)

040694-335

Location No. C40594 AD 60 0 506 MR Sample No. 040694-335

Site Name Kalamazoo River

Collector Mike Harris Date Collected 04-05-94

Processor Matt Donohue Date Processed 04-06-94

Trap Type 1.5 Double coil Foothold Live (Dead) (circle one)

Genus/Species Ondatra zibethica

Total(mm) 533 Tail (mm) 212 Hind Foot (mm) 71 Ear (mm) —

w/o pelt -1100.3

Weight(g) w/o pelt liver, kidneys, colon contents, stomach contents, lower left jaw - 900g Partial Whole (circle one)

Ectoparasites: Y N _____ Saved Discarded (circle one)

Endoparasites: Y N _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L 2.40 R 2.38

L Testicle (mm): L 24 W 15

R Testicle (mm): L 23 W 16

Seminal Vesicle: Small (Large) (circle one)

Epididymis: (Conv) Not Conv. (circle one)

Female

Ovary Weight (g): L_____ R_____

Left Ovary (mm): L_____ W_____

Right Ovary (mm): L_____ W_____

Placental Scars L_____ R_____

Embryos (no.) L_____ R_____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	47.57	portion of liver removed for histo prior to weighing
Spleen	0.615	
Adrenal	L 0.102 R 0.087	
Kidney	L 4.64 R 2.95	4.65 Approx ½ of right kidney taken for histo prior to weighing
Thymus	0.20.1	
		Tw 1236.7

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	(Adult)	(circle one)
Age Based on Body Size:	Juvenile	Subadult	(Adult)	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments:

Colon contents - 79.6g

Stomach Contents - 52.3g Greenish-yellow, fibrous, firm, fibers are small and densely packed

Lower left jaw - 4.60g

pelt scrapings - 25.89g

Worksheet:

	(g)	REAC	DNR (g)
total fresh wt			1369 g
Carcass wt		900 g	
liver wt		47.57 g	total liver = 48.47 g
kidney wt		7.59 g	total kidney = 9.29 g

(over)

REAC

Location No. 040794/ADIL0501MK Sample No. 040894-392

Site Name Kalamazoo River

Collector Mike Harris Date Collected 4/7/94

Processor Phil Kim Date Processed 4/8/94

Trap Type 1.5 Double Coil Foothold Live (Dead) (circle one)

Genus/Species ~~Odontra zibethica~~

Total(mm) 685 Tail (mm) 260 Hind Foot (mm) 63 Ear (mm) ——

Weight(g) [1116.4] (w/o jaw, pelt, lower GI contents) (Partial) Whole (circle one)

Ectoparasites: Y (N) —— Saved Discarded (circle one)

Endoparasites: Y (N) —— Saved Discarded (circle one)

Male

Testicle Wt (g): L 2.760 R 2.581

L Testicle (mm): L 25 W 17

R Testicle (mm): L 26 W 15

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

Female

Ovary Weight (g): L____ R____

Left Ovary (mm): L____ W____

Right Ovary (mm): L____ W____

Placental Scars L____ R____

Embryos (no.) L____ R____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) ____ w/o Ovaries (g) ____

ORGAN	WEIGHT (g)	COMMENTS
Liver [59.033]	~~[55.152]~~ (a)	Weight partial
Spleen	4.174	
Adrenal	L 0.227 R 0.175	
Kidney	L [2.095] R 5.559	Left kidney partial 3.495
Thymus	0.580	
		7a 15.33.2

55.152
3.881
59.033

(over)

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	(Adult)	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments:

GI contents very small relative to previous animals.
Lower GI contents: 4.8g
stomach empty, extremely shrunken and convoluted.
Lower jaw: 3.179g
Pelt scrapings: 27.003g
~~pelt~~ PB

	DNR	REAC calc.
Total fresh weight	1538 g	~~1153.88 g~~ PB
Carcass fresh weight	~~1116.4~~ PB	1116.4 g
Liver fresh weight		59.03 g → 60.13 g total
Kidney fresh weight		7.654 g → 9.054 g total

Worksheet:

5
116.1
~~113~~
111.3
4.8

3
1141.9
25.5
1116.4

Location No. _____ Sample No. 042694 AD060210 MK

Site Name KALAMAZOO RIVER

Collector MIKE HARRIS - MICHIGAN DNR Date Collected 4-26-94

Processor P. BOVITZ Date Processed 4-28-94

Trap Type _____ Live (Dead) (circle one)

Genus/Species Mustela vison

Total(mm) _____ Tail (mm) _____ Hind Foot (mm) _____ Ear (mm) _____

elt 189.6 g

Weight(g) 953.2 g w/o pelt (Partial) Whole (circle one)

Ectoparasites: (Y) N Mites Saved Discarded (circle one)

Endoparasites: Y (N) _____ Saved Discarded (circle one)

Male

Testicle Wt (g): L 1.587 PB 1.22 R 1.221

L Testicle (mm): L 18mm W 12mm

R Testicle (mm): L 18mm W 14mm

Seminal Vesicle: Small Large (circle one)

Epididymis: Conv. Not Conv. (circle one)

adult

Female

Ovary Weight (g): L _____ R _____

Left Ovary (mm): L _____ W _____

Right Ovary (mm): L _____ W _____

Placental Scars L _____ R _____

Embryos (no.) L _____ R _____ (if present, use worksheet on back to record metrics)

Mammaries: Small Large Lactating (circle one)

Vagina: Inactive Cornified Turgid Plugged (circle one)

Repr. Stage: Nulli Semi Multi (circle one)

Uterus w/ Ovaries (g) _____ w/o Ovaries (g) _____

ORGAN	WEIGHT (g)	COMMENTS
Liver	59.07	
Spleen	4.357 g	
Adrenal	L 0.107 R 0.119	
Kidney	L 4.930 R 2.279 g	
Thymus	not found	
_____	_____	TW 1137.337

(over)

Animal arrived frozen.

Dorsal Pelage Color _____ Ventral Pelage Color_____ Side Pelage Color_____

Age Based on Sex Organs:	Juvenile	Subadult	Adult	(circle one)
Age Based on Body Size:	Juvenile	Subadult	Adult	(circle one)
Age Based on Pelage:	Juvenile	Subadult	Adult	(circle one)

Comments:

weights (g)

23.263 Stomach contents
intestine (colon) contents

11.40 g intestine

5.983 g lower jaw

Worksheet:

Total fresh wt

liver (w/o section) 59.07

liver (total) 59.67

Kidney w/o 7.209

kidney (total) 9.409

(over)

APPENDIX E
HISTOPATHOLOGY RESULTS

Virginia-Maryland Regional College of Veterinary Medicine
Virginia Polytechnic Institute and State University
Blacksburg, Virginia 24061
703-231-7666

HISTOPATHOLOGY REPORT

MAY 27,1994

Case No. 94-1671

VEIT, HUGO

VET: VEIT, HUGO

OWNER: R. F. Weston
REAC
Edison, N.J.
08837
908-321-4210

PATIENT NAME: Kalamazoo River Project
SPECIES: SMALL OTHER

DATE SAMPLE RECEIVED: APR 18,1994
HISTORY:
This report relates to project number 3347-035-01-6697, known as the Kalamazoo River Project. Samples were received on April 13, 1994. and consisted of 40 wide mouth bottles containing formalin fixed tissues, to be described in the subsequent report. These specimens were held in a locked site, until processing by Dr Veit. There were 40 sample bottles, marked 1 to 40, packed in random groups of 5 bottles within zip-lock plastic bags and within a loose packing material, all within a large insulated cooler, taped shut, and received intact. All containers were also closed, well identified and intact. Samples were given an in-house case number of HR 94-1671, and the same sample number assigned by Weston was added as a specific suffix (Weston sample no. 1 was identified as 94-1671HR-1, etc. to 94-1671HR-40). All paraffin blocks and histologic slides used this number system. Dr Hugo P. Veit opened the sealed shipping container at 1:45pm, April 18, 1994 and trimmed samples 22,23,25,29,31,33, 34,36,38 and 40. The remainder of the samples were trimmed and delivered to the histopathology laboratory on April 20,1994. The tissues were processed and stained with routine hemotoxyln-eosin staining procedures, using automated equipment, for consistancy. The slides were delivered to Dr. Veit, and kept in a locked room at all times, until return to Weston. All histologic slides, pariffin blocks, sample bottles containing residual tissue samples, and the original copy of chain of custody sheets (2 - signed by Dr Veit) are to be returned to R. F. Weston, Inc. following completion of this work. Aside from the sample numbers, and blinded locational code numbers, the only information available to Dr. Veit prior to evaluation of the tissues, was the species of the tissue, and identification of the tissue types in each bottle. Therefore, the tissues were evaluated in a blind fashion, relative to their source or potential environmental exposure. Other material has been received, aside from the above samples, but the latter samples have not yet been processed or

evaluated. That material will be processed, evaluated and reported as an addendum to this report, and will be so identified. Dr. Paul Bovitz and Ms. Debbie Brooks have been the contact persons for us on this project.

HISTOLOGIC DESCRIPTION:

Note: For identification, all samples below are numbered from 1 to 41. These numbers are the same as the sample numbers on the chain of custody/ lab work request forms (nos. 9327 and 9328 supplied with the first samples, from Weston to Dr. Veit), with number 41 being the first listed sample (AD060210MK) on chain of custody form no. 9564, received 5/5/94.

For example, sample number 1 is also identified as 120893-BG370307MR on the aforementioned form (#9327), under sampling location heading. Sample no.1 tissue block and slide are identified as 94-1671HR - 1. Sample blocks and slides for samples 2 to 41 are labelled 94-1671HR - 2 to 41, respectively. The number after the listed tissues below represents the number of pieces of each tissue examined, which is usually the number of pieces submitted.

Sample 1
liver (2) - diffuse congestion, slight
- perivascular lymphoid inflammation, minimal
kidney (2) - subcapsular granuloma, focal, microscopic
interpretation - There is a minimal immune response to an unidentified antigen in this animal, otherwise the liver and kidney tissues are unremarkable.

Sample 2
liver (2) - diffuse congestion, slight
- lymphocytic infiltration, sinusoidal, scattered, minimal
kidney (2) - interstitial granulomatous inflammation, cortical, slight
interpretation - There is a minimal granulomatous interstitial nephritis presumed to be a very slight immunologic host response to an unidentified antigen. Both kidney and liver appear unremarkable, otherwise.

Sample 3
liver (2) - unremarkable
kidney (2) - unremarkable
interpretation - Normal tissue

Sample 4
liver (2) - unremarkable
kidney (2) - autolysis, slight to moderate
interpretation - Normal tissue, with slight to moderate renal autolysis.

Sample 5
liver (2) - hepatocellular nuclear and cytoplasmic pleomorphism, slight
kidney (1) - lymphoid nodular aggregation, interstitial, cortical, minimal
interpretation - The hepatocellular pleomorphism, including slightly increased numbers of mitotic figures, suggests an increased cell turnover rate or a more rapidly dividing hepatocellular population, with disturbed cell activity. This could relate to a mild metabolic or toxic cause, in which there is a slightly shortened hepatocellular life-span or increased cell turnover. The lymphoid inflammation in the kidney suggests a very weak immunologic host response to an unidentified antigen.

Sample 6
liver (2) - lymphoid nodular aggregation, perivascular, minimal
kidney (2) - unremarkable
interpretation - The hepatic perivascular lymphoid nodules suggest a minimal host immunologic response to an unidentified antigen, with an

otherwise normal liver. The kidney appears normal.
Sample 7
liver (2) - lymphocytic, plasmacytic infiltration, periportal, mild
kidney (2) - unremarkable
interpretation - There is a very mild periportal lymphoid infiltration in the liver, suggestive of an incidental host immunologic response to an unidentified antigen, otherwise the liver is unremarkable. The renal tissue is normal.
Sample 8
liver (2) - unremarkable
kidney (2) - lymphocytic, plasmacytic infiltration, cortical interstitium, slight
interpretation - Normal liver, with minimal cortical interstitial inflammation of the kidney. The latter is likely incidental (non-clinical).
Sample 9
liver (3) - parasitic cyst, solitary
- parasitic egg aggregations, hepatocellular, multifocal
kidney (2) - autolysis, slight
interpretation - The parasitic cyst has a thin fibrous capsular wall, with lymphoid infiltration of the peripheral capsule. The cyst lumen contains sections of a flatworm, having calcareous corpuscles and an inner muscle layer, both suggestive of the class Cestoda, likely of either the genus Taenia or Cysticercus. The egg aggregations or clusters are producing a slight granulomatous inflammation associated with some of the eggs. The eggs have double polar caps and are compatible with those seen with Capillaria hepatica. The kidney is normal, with mild autolysis.
Sample 10
liver (2) - diffuse congestion, slight
kidney (2) - autolysis, slight
interpretation - The hepatic congestion is a non-specific change, which may relate to agonal conditions of the animal. The kidney is normal, but slightly autolytic.
Sample 11
liver (2) - hemosiderosis, Kupffer cells, diffuse, mild
kidney (2) - unremarkable
interpretation - There was likely some kind of mild hemolytic event which occurred in this animal, leading to the mild accumulation of hemosiderin-like material in the Kupffer cells. Such hemolysis could have been due to a traumatic, infectious or metabolic event, but was not associated with the recent capture. The kidney appears normal.
Sample 12

liver (2) - unremarkable
kidney (2) - unremarkable
interpretation - Normal liver and kidney

Sample 13
liver (2) - hemosiderosis, Kupffer cells, random, minimal
kidney (2) - autolysis, slight
interpretation - Accumulation of scanty amounts of green brown pigment in the Kupffer cells suggests an old episode of hemolysis, cause unknown. Kidney is normal, but slightly autolytic.
Sample 14
liver (2) - parasitic cyst, solitary
- nuclear and cytoplasmic pleomorphism, hepatocellular, slight to moderate

kidney (2) - autolysis, slight
lung (1) - hyperplasia, bronchus associated lymphoid (BALT) tissue, mild
- alveolar dilation, variable, mild
interpretation - There is a tapeworm cyst, likely Taenia or Cysticercus species, and diffuse, variable pleomorphism of hepatocytes. The latter changes may relate to disturbance of the liver tissue secondary to the cyst, or some other metabolic disturbance, affecting the hepatocytes, more generally. The kidney is normal, and slightly autolytic. The BALT hyperplasia suggests a host response to a former exposure to antigen, via the airways. The alveolar variation in size, to dilation, suggests some kind of mild upper airway stenosis or incomplete blockage. No neoplastic or infectious cause is noted in the section examined, to help explain airway stenosis.
Sample 15
liver (2) - unremarkable
kidney (2) - autolysis, slight
interpretation - Normal liver and kidney, with slight autolysis of the latter.
Sample 16
liver (2) - sinusoidal dilation with hepatocellular distortion, moderate
kidney (2) - autolysis, moderate, with tissue distortion, moderate
interpretation - There was evidently moderate autolysis, and what appears to be freezing artifact. Frozen tissue often is distorted by the formation of expanding water crystals in the tissue which creates a pattern like that sMeen in both the liver and kidney of this animal. Subtle tissue changes are usually obliterated by freezing. No obvious changes were noted.
Sample 17
liver (2) - unremarkable
kidney (1) - unremarkable
interpretation - Normal liver and kidney
Sample 18
liver (2) - hemorrhage, focal, internal
- hepatocellular degeneration, centrilobular to mid-zonal, mild
kidney (1) - autolysis, slight
interpretation - There is a mild degenerative hepatopathy or hepatosis, cause unknown, but possibly toxic or ischemic. There appears to be an irregular focal area of hemorrhage, causing internal distortion of the liver. This was apparently an acute change, possibly occurring during final capture. Likely, the hepatocellular degeneration predisposed tissue weakness and internal fissuring, allowing the hemorrhage to occur or accumulate. The kidney is normal, and slightly autolytic.
Sample 19
liver (2) - unremarkable
kidney (3) - autolysis, slight
interpretation - Normal liver, with slightly autolytic, normal kidney
Sample 20
liver (2) - hemosiderosis, Kupffer cells, diffuse, minimal
kidney (2) - autolysis, slight
interpretation - The liver is normal, with evidence of a previous, small hemolytic event, cause unknown. The kidney is normal, with slight autolysis.

Sample 21
liver (2) - unremarkable
kidney (2) - unremarkable

interpretation - Normal liver and kidney
Sample 22
liver (2) - sinusoidal dilation, with hepatocellular compression, moderate
kidney (2) - spacing artifacts, diffuse, moderate
interpretation - Freezing artifact of the tissues is suspected, which are otherwise unremarkable and interpreted as normal.

Sample 23
liver (2) - unremarkable
kidney (2) - unremarkable
interpretation - Normal liver and kidney

Sample 24
liver (2) - nuclear and cytoplasmic pleomorphism, hepatocellular, slight
- congestion, diffuse, moderate
kidney (2) - glomerulitis, membranous, slight
interpretation - There is a minimal to mild hepatopathy, and a variable, mild membranous glomerulitis, with dense eosinophilic hyaline droplets noted in a minority of the collecting tubules. These droplets are interpreted to be proteinacious material, lost through the affected glomeruli and tubules.
Sample 25
liver (2) - nematode granulomas and abscesses, multifocal to coalescing
kidney (2) - autolysis, slight
interpretation - There are adult nematode sections, and eggs which are morphologically compatible with Capillaria hepatica. The eggs and/or nematodes are associated with multiple sites of hepatocytes undergoing variable degrees of coagulative necrosis, with eosinophilic to neutrophilic inflammation, and/or lymphoid and macrophage inflammation. The kidney is normal, and slightly autolytic.
Sample 26
liver (2) - nematode egg granulomas, multiple
kidney (2) - autolysis, slight
interpretation - There are many aggregations of nematode eggs, compatible with Capillaria hepatica, within the parenchyma, sometimes near or in the periportal areas. These eggs are typically within a necrotic center, surrounded by granulomatous inflammation, and nearby lymphocytic or plasmacytic aggregations. The lesions are chronic and appear static. The kidney is normal, and slightly autolytic.
Sample 27
liver (3) - parasitic cyst, solitary
kidney (2) - autolysis, slight
pancreas (1) - unremarkable
salivary gland (1) - unremarkable
interpretation - There is slight autolysis of the kidney which is otherwise normal, as is the pancreas and what is presumed to be salivary gland tissue. A cestode within an encapsulated hepatic cyst is noted and is compatible with either Taenia or Cysticercus genuses.
Sample 28
liver (2) - unremarkable
kidney (2) - autolysis, moderate
interpretation - Normal liver and kidney with moderate renal autolysis
Sample 29
liver (3) - abcesses, multifocal to coalescing
- nematode migration, slight

kidney (2) - autolysis, moderate to severe
interpretation - The multifocal abscesses noted in the liver did not contain nematode eggs, larvae or adults, but larval nematode forms, possibly Capillaria spp. were noted near some of the abscesses. Possibly, migration by these parasites directly caused the necrosis of the hepatocytes, or more likely allowed for opportunistic bacterial infection of the migration paths. Hence, these abcesses are circumstancially associated with the nematode migrations. The kidney is normal, with moderate to severe necrosis.
Sample 30
liver (2) - unremarkable
kidney (2) - unremarkable
interpretation - Normal liver and kidney
Sample 31
liver (2) - parasitic granulomas, necrotizing, multifocal
kidney (2) - autolysis, moderate to severe
interpretation - Migrating nematodes, compatible with Capillaria spp. are noted in intact hepatocellular parenchyma, and within centrally necrotic granulomas. The liver is otherwise unremarkable, and no lesions are noted in the kidney. The kidney is moderately to severely autolytic, and therefore difficult to evaluate.
Sample 32
liver (2) - unremarkable
kidney (2) - neutrophilic inflammation, tubular, focal
- autolysis, moderate
interpretation - The liver is normal, and there is a focal tubular nephritis, of incidental degree in the section, possibly due to a mild bacterial infection. There is moderate renal autolysis.
Sample 33
liver (2) - nuclear and cytoplasmic pleomorphism, hepatocellular, moderate
kidney (2) - unremarkable
interpretation - A high cell turnover rate and slightly variable cell morphology, due to a metabolic disturbance is suspected.
Sample 34
liver (4) - parasitic granulomas, necrotizing, multifocal
kidney (2) - unremarkable
interpretation - There are eggs, compatible with Capillaria hepatica noted near, and within one of many granulomas, usually with a necrotic center, and a combination of lymphoid cells and macrohages/giant cells, more peripherally. Eosinophils and neutrophils are associated with some granulomas, as well. The kidney is normal.
Sample 35
liver (2) - hemosiderosis, Kupffer cells, diffuse, slight
kidney (2) - unremarkable
interpretation - The kidney is normal. The hemosiderin in the Kupffer cells suggests slight hemolysis occurred, with the cause unknown, in the past, not very recently.
Sample 36
liver (2) - unremarkable
kidney (2) - unremarkable
interpretation - Normal liver and kidney
Sample 37
liver (2) - nuclear and cytoplasmic pleomorphism, hepatocellular, moderate
kidney (2) - nuclear pleomorphism, proximal tubular epithelium, slight

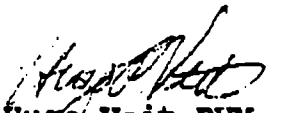
interpretation - The histologic variation of the cells is not well understood, but is suspected to relate to a metabolic disturbance, cause unknown. Some increased cell turnover is also suspected, in both the liver and kidney.
Sample 38
liver (2) - unremarkable
kidney (2) - plasmacytic and lymphocytic cortical interstitial infiltration mild
interpretation - The liver is normal, and there is a mild renal immunologic cortical interstitial response, presumably to an antigen of unknown origin.
Sample 39
liver (2) - unremarkable
kidney (1) - unremarkable
interpretation - Normal liver and kidney
Sample 40
liver (2) - unremarkable
kidney (1) - interstitial nephritis, granulomatous, minimal
interpretation - Normal liver, with a very slight renal interstitial infiltration of plasmacytes, lymphocytes and monocytes, multifocal, and mostly in the cortex is noted, and suspected to be host immunologic response to an antigen of unknown origin.
ADDENDUM - 5/26/94
Sample 41 (AD060210MK)
liver (1) - congestion, diffuse, mild
- lipidosis, hepatocellular, diffuse, mild to moderate
kidney (2) - unremarkable
interpretation - Normal kidney. The vacuolization of the hepatocytes could represent a high plane of lipid metabolism, or some kind of mild physiologic or metabolic disturbance.

COMMENTS:
Samples sent on May 5, 1994, and questions relating to that submission, will be sent as an addendum to this report, within 10 days. Also, there are some free parasites, which will be identified, as soon as Dr. Zajac, our parasitologist returns. Dr John Robertson and I appreciate the opportunity to work with you. We'll be in contact early next week.
ADDENDUM - 5/27/94 - A cover letter describes report submission details. Final report of histopathologic findings - summary and conclusions:

Rat sample (1) - There were no remarkable (abnormal) observations (sample no.3).
Mink samples (10) - Most (7/10) of the samples had either no or minor to incidental changes. Two mink had minor lesions which could be associated with mild metabolic or toxic disturbances (samples 37 and 41), a and one had a minimal interstitial nephritis (sample 40). No parasitism was noted in any of the mink liver or kidney tissues examined. Overall, the mink tissues revealed only mild changes, with no evidence of significant biologic liver or renal disfunction.
Muskrat samples (30) - Parasitic lesions were seen in 8/30 samples (#9, 14, 25, 26, 27, 29, 31 and 34), all in the livers and were either tapeworm cys and/or Capillaria hepatica nematodes. Clearly, these muskrats have a frequent exposure to these 2 parasite types. Being blinded to location, I have no idea if there is any site effect on parasite lesion type or incidence. Mild hemosiderin loading of Kupffer cells lining the sinusoids

in the liver, was seen in 4/30 of the muskrats (#11, 13, 20 and 35). This change suggests an increased red cell turnover or past hemolytic event. Such could relate to toxic, infectious, parasitic or physical injury, in this case mild, and likely not isolated to only the recent past. Hepatocellular pleomorphism noted in the muskrat was subtle and likely related to a mild metabolic or toxic disturbance. It was seen in 4/30 animals (#5, 14, 24, and 33). An additional muskrat (#18) showed mild hepatocellular degeneration, also attributable to a mild toxic insult.

There were mild renal lesions in 2/30 animals (#24 and 32), with mild to severe autolysis very common to the muskrats of this study (17/30), suggesting some improvement in tissue collection and fixation might be helpful in producing better fixed tissues for evaluation. Field collection problems or constaints may not allow such improvements to be made. Minimal inflammatory or immunologic foci were noted in the livers and kidneys, but aside from parasitic lesions, none appeared intense enough to raise any concern that they were anything more than normal host response to a variety of viable or non-viable antigenic materials in the environments of these animals. In summary, beyond the hepatic parasitism, there were no moderate to severe liver or kidney lesions in the muskrat tissues submitted. There were a few mild hepatic lesions suggestive of toxic or metabolic disturbances in #5, 14, 18, 24, and 33, and renal degeneration, possibly due to toxic exposure in #32. Overall, there was no evidence for significant infectious (non-parasitic) disease in any of the animal tissue examined. A minority of mink and muskrat had lesions suggestive of mild toxic or metabolic disease, and a large minority of muskrats were parasitized in the liver. Generally, the tissues suggested the animals were likely to appear clinically normal, with the parasitized muskrats as possible exceptions.



Hugo Veit DVM, PhD
Veterinary Pathologist

6955244

NAME/SPECIES: WESTON, UNKNOWN
REQUESTING DR: WESTON
ANIMAL ID: UNKNOWN
UNK

WESTON/REAC PROJECT
2890 WOODBRIDGE AVE #209
EDISON, NJ 08837-3679

ARP ID#: (6727)000-89-1142
RECEIVED: 01SEP93
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PAGE: 1

VETERINARY PATHOLOGY

CASE#: VR-93-00795

RESEARCH

VR-93-795 Examination of the multiple tissues from the submitted animals reveals the following:

Animal #277

Liver - this tissue demonstrates normal architecture with very mild congestion. No evidence of toxicity or alteration of the hepatic parenchyma can be identified in this section.

Kidney - this tissue is slightly autolyzed, with some dissociation of the renal tubular elements as the result of autolysis. If there is any type of acute tubular change, we were unable to identify it due to the autolysis. In general, the kidney has a normal appearance and normal architecture, with very mild to moderate autolysis. The glomerular elements are histologically normal. No evidence of inflammation or toxicity could be identified.

Animal #278

Liver - this hepatic tissue is very mildly congested. Mild vacuolization of the hepatocytes and moderate autolysis can be identified. There are focal collections of neutrophils in the sinusoids. This may suggest some type of inflammatory process. A large cystic structure at one location is surrounded by granulation tissue and collections of inflammatory cells. This could be the result of a parasitic cyst and granuloma, which would be a natural parasite for this individual.

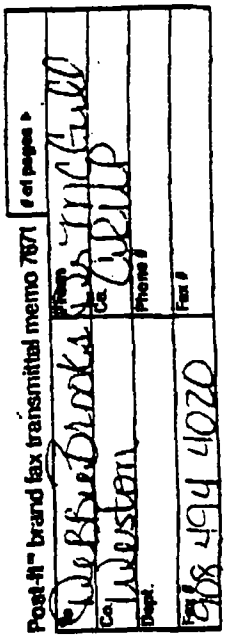
Kidney - this tissue demonstrates slight tubular autolysis and acute congestion, with minimal inflammation. Other specific changes that would support toxicity or infection cannot be identified in the kidney. The glomerular elements appear to be histologically normal.

Animal #279

Liver - this tissue is acutely congested, with no specific degeneration or inflammation. A large cystic structure has occurred at one location. This

Continued on Next Page...

ASSOCIATED REGIONAL AND UNIVERSITY PATHOLOGISTS
500 CHIPETA WAY, SALT LAKE CITY, UTAH 84108
Carl R. Kjeldsberg, M.D., Laboratory Director



6955244

ME/SPECIES: WESTON, UNKNOWN
QUESTING OR: WESTON
IMAL ID: UNKNOWN
K

WESTON/REAC PROJECT
2890 WOODBRIDGE AVE #209
EDISON, NJ 08837-3679

ARP ID#: (6727)000-89-1142
RECEIVED: 01SEP93
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PAGE: 2

VETERINARY PATHOLOGY

CASE#: VR-93-00795

RESEARCH

cyst is filled with a cestode. Granulation tissue and inflammation are secondary. The type of cyst is a cestode, but other specific etiologic agents or changes are not identified.

Kidney - the renal tissue demonstrates a diffuse infiltration of lymphocytes, plasma cells, and neutrophils, with some degeneration of the interstitial tissue and secondary tubular change. This type of reaction supports a chronic inflammatory process and suppurative reaction. Evidence of specific tubular changes or other specific reactions could not be identified. No other specific etiologic agents or parasites or other evidence of toxicity could be identified in this tissue.

Animal #280

Liver - the liver tissue is histologically normal, with very mild congestion and no evidence of inflammation. No cystic structures were identified in this liver.

Kidney - this tissue demonstrates slight tubular autolysis, but it is present to a lesser degree than we have described previously. There is some acute congestion in the tissue, and no other specific reaction. Inflammation or toxicity are minimal.

Animal #281

Liver - this section of liver demonstrates mild congestion with minimal hepatocellular vacuolization and no evidence of toxicity or inflammation.

Kidney - the renal tissue demonstrates very mild autolysis, but generally the tubular elements are uniform and histologically normal, with no evidence of toxicity or specific inflammation. The glomerular elements appear to be relatively normal.

Animal #282

Liver - this tissue is acutely congested, with a cystic structure. The cyst is surrounded by granulation tissue, fibrin, and neutrophils.

Kidney - this tissue is acutely congested, with mild autolysis very similar to that described previously. No evidence of tubular change, glomerular

Continued on Next Page...

6955244

ME/SPECIES: WESTON, UNKNOWN
QUESTING DR: WESTON
IMAL ID: UNKNOWN
K

WESTON/REAC PROJECT
2890 WOODBRIDGE AVE #209
EDISON, NJ 08837-3679

ARP ID#: (6727)000-89-1142
RECEIVED: 01SEP93
PRINTED: 02SEP93 0104
PAGE: 3

VETERINARY PATHOLOGY

CASE#: VR-93-00795

RESEARCH

change, toxicity, or even infection can be identified in this renal parenchyma.

DIAGNOSIS:

1. Cestode parasitic cyst with mild secondary inflammation in livers #278, #279, and #282.
2. Moderate chronic pyelonephritis in #279.
3. Slight autolysis in all kidneys.

COMMENTS:

These tissues do not support any evidence of toxicity or specific change. The pyelonephritis in #279 can occur as a sporadic natural occurring disease in any group of animals. The parasitic infestation is common in feral animals, and very likely this particular animal in an intermediate host for this particular cestode, since three out of the six animals show cestode cysts in the liver. There was no evidence of of toxicity of specific change in the liver and no evidence of toxicity in the renal tissue.

09/01/93
(LDM/tko) Verified by: L. D. McGill, D.V.M., Ph.D.
Veterinary Pathologist
electronic signature

For Histopathology Consultation Call: 1-800-426-2099

STON, UNKNOWN

END OF CHART

Roy F. Weston, Inc.
REAC, Edison, N.J.
EPA Contract 68-03-3482

CHAIN OF CUSTODY RECORD/LAB WORK REQUEST

No: 8380

SHEET NO 1 OF 1

Project Name: Kalamazoo River
Project Number: 0347.034.001.5697
RFW Contact: Paul Bowie Phone: (908) 321-4616

SAMPLE IDENTIFICATION — ANALYSES REQUESTED

REAC #	Sample No.	Sampling Location	Matrix	Date Collected	# of Bottles	Container/ Preservative		Kidney Tissue Histo	Liver Tissue Histo	
278	BC37020?MR	~~Battle Creek~~ BC37	X *	8/11/93	1	8oz glass w/ 10% formaldehyde		✓	✓	
281	BC37030?MR	~~Battle Creek~~ BC37	X *	8/12/93	1	"	"	✓	✓	
279	BC38020?MR	BC38	X *	8/11/93	1	"	"	✓	✓	
282	BC38030?MR	BC38	X *	8/12/93	1	"	"	✓	✓	
277	BC21010?MR	BC21	X *	8/10/93	1	"	"	✓	✓	
280	BC21030?MR	BC21	X *	8/12/93	1	"	"	✓	✓	

ends of Samples

Matrix:
SD - Sediment; PW - Potable Water; S - Soil
DS - Drum Solids; GW - Groundwater; W - Water
DL - Drum Liquids; SW - Surface Water; O - Oil
V - Other; SL - Sludge; A - Air

Special Instructions:
* X = animal tissue (liver + kidney)
per requested on MB 8/25/93

FOR SUBCONTRACTING USE ONLY
FROM CHAIN OF CUSTODY #

Items/Reason	Relinquished By	Date	Received By	Date	Time	Items/Reason	Relinquished By	Date	Received By	Date	Time
All/Analysis	Matt Hinkle	8/25/93	Anne Hill	8/25/93	8:00	all/analysis	[illegible]	8/25/93			

SEP 23 '93 08:37

APPENDIX F
MINK AND MUSKRAT AGING RESULTS

By: Gary Matson
Matson's, Box 308, Milltown MT 59851
Phone: (406) 258-6286

Prepared for: Matt Donohue
Roy Weston Inc
Edison NJ
Process code: d
Filename: AD051794-222Y
Date: 17 May 1994

Tooth type: Mink canine
Muskrat M1 + mandible
Season of collection: December - February

Species: Mink (7)
Muskrat (18)

Notes:

"B" RELIABILITY CEMENTUM AGES: THERE IS HISTOLOGICAL EVIDENCE TO SUPPORT THE REPORTED CEMENTUM AGE. IF ERROR IS PRESENT, IT WOULD BE LIKELY WITHIN THE RANGE GIVEN UNDER "NOTES".

"C" RELIABILITY CEMENTUM AGES: THERE IS LITTLE HISTOLOGICAL EVIDENCE TO SUPPORT THE REPORTED CEMENTUM AGE, WHICH MIGHT BE WITHIN THE RANGE GIVEN.

MINK CANINE: MATSON'S STANDARDIZED CEMENTUM AGING MODEL WAS USED FOR CEMENTUM AGING. CEMENTUM ANNULI ARE REGULAR AND DISTINCT, AND AGES DETERMINED FROM THEIR COUNT ARE CONSIDERED TO BE HIGHLY ACCURATE.

MUSKRAT MOLAR NUMBER 1: SPECIMEN SECTIONING METHOD. THE TOOTH WAS REMOVED BY CUTTING THE MANDIBLE ON EITHER SIDE OF IT WITH A LAPIDARY SAW. THE RESULTING TISSUE PIECE WAS SECTIONED WITH M1 INTACT IN ITS SOCKET.

MUSKRAT CEMENTUM AGING MODEL. REFERENCE: NOTES GIVEN IN AGE REPORT OF 2 NOVEMBER 1993; PAUL BOVITZ; AGING FILE AM110293-201.

CEMENTUM ANNULI OF M1 HAVE CHARACTERISTICS DIFFERENT FROM THOSE OF OTHER SPECIES. ANNULI ARE POORLY DEFINED, AND APPEAR TO BE COMPLEX (HAVING MORE THAN A SINGLE ANNUAL COMPONENT). NEITHER ACCURACY NOR PRECISION OF CEMENTUM AGES DETERMINED BY COUNTING APPARENT ANNULI IS KNOWN.

THE CHARACTERISTICALLY SMALL AMOUNT OF CEMENTUM AND UNDEVELOPED TOOTH ROOTS OF TEETH CLASSIFIED AS AGE "0" APPEAR TO BE GOOD CRITERIA FOR MICROSCOPIC IDENTIFICATION OF THE AGE CLASS.

TEETH AGED AS OLDER THAN 0 YEARS HAVE A CHARACTERISTICALLY LARGER AMOUNT OF CEMENTUM AND GREATER ROOT DEVELOPMENT. HOWEVER, POOR ANNULUS DEFINITION IS REASON TO TREAT THE CEMENTUM AGES AS APPROXIMATIONS.

THE HISTOLOGICAL CONDITION OF THE TEETH WAS EXCELLENT. IN THE TOOTH SECTIONS, THE INTACT PERIODONTAL MEMBRANE CONFIRMS THAT NO CEMENTUM IS MISSING FROM THE PERIPHERY OF THE ROOT. DIFFERENTIAL STAINING BETWEEN DARK CEMENTUM ANNULI AND LIGHT CEMENTUM IS POOR (ANNULI ARE POORLY DEFINED). FACTORS THAT CAUSE POOR HISTOLOGICAL CONDITION, CEMENTUM DAMAGE, OR POOR DIFFERENTIAL STAINING INCLUDE PHYSICAL ABRASION, PROLONGED EXPOSURE TO HIGH TEMPERATURES (AT OR ABOVE BOILING), AND EXPOSURE TO CHEMICAL AGENTS SUCH AS BLEACH.

Species	SLIDE #	TOOTH ID	Age	CC	Notes
MI	1	BG54@3@2	3	A	
MI	2	121593-8@3	2	A	
MI	3	121693-823	@	A	
MI	4	@2179TB1@4@2MK	3	A	
MI	5	121593-8@5	@	A	
MI	6	122193-877	1	A	
MI	7	@21794-@25	@	A	
MUSKRAT	8	@126948D17@1@1MR	2	B	1-2
MUSKRAT	9	REAC121@93-77@	@	A	
MUSKRAT	1@	@126948D@2@1@2MR	3	C	3-5
MUSKRAT	11	@21794-@29	1	B	@-1
MUSKRAT	12	TB16@4@6MR	2	C	2-4
MUSKRAT	13	@12494-98@	1	B	1-2
MUSKRAT	14	@12994-985	@	B	@-1
MUSKRAT	15	SAMPLE RAT	@	B	@-1
MUSKRAT	16	@21794-@3@	1	B	1-2
MUSKRAT	17	121@93-768	@	B	@-1
MUSKRAT	18	121@93-767	@	A	
MUSKRAT	19	@21694TB25@3@5MR	@	A	
MUSKRAT	2@	@12994-982	@	A	
MUSKRAT	21	121@93-766	2	C	2-4
MUSKRAT	22	121@93-765	@	A	
MUSKRAT	23	@21694T832@3@3MR	@	A	
MUSKRAT	24	@12794@D12@2@5MR	3	C	3-5
MUSKRAT	25	121@93-769	@	A	

CERTAINTY CODES: A, B, C. A letter suffix is a reliability indicator or "certainty code" for a determined age. Some tooth sections have a distinct annulus pattern and the result of age analysis is nearly certain. The result of the analysis of other tooth sections is less certain because of indistinct or irregular annuli or because portions of the tooth root may have been missing.

A = result nearly certain. B = some error possible. C = error likely.

The judgement about whether a determined age could be in error is subjective. Criteria for certainty code assignment are as follows:

1. Distinctness of cementum band staining.
2. Regularity of cementum band pattern.
3. Relative amount and location of cementum and dentine.
4. Histological characteristics of cementum.

We have no evidence supporting any relationship between our certainty code and accuracy, but generally relate the most accurate results to the "A" certainty code.

Accuracy limits have been established as outlined below. For example , if I think that a 9-year-old mammal could be a year older or younger because of an unclear cementum pattern, it would be given a certainty code of "A" along with the determined age of 9 years. If I think that a 6-year-old mammal could be a year younger or older, the certainty code of "B" would be given.

	Certainty Code		
Determined Age	A	B	C
1-7 years	+/- 0 years	+/- 1	+/- 2
8-15	+/- 1	+/- 2	+/- 3
16+	+/- 2	+/- 3	+/- 4+

THE REPORT GIVES AGE AT THE LAST BIRTHDAY, in the same style as human age is given. The dates below are the standardized "birthdays" we use for each species.

1 February - black bear, grizzly bear.
1 April - bobcat, lynx, gray fox, kit fox, red fox, river otter, mink, marten, fisher, badger, wolverine.
1 May - pronghorn, arctic fox, coyote, wolf, striped skunk, raccoon.
1 June - deer, elk, moose, caribou, goat, sheep, bison.

EXPLANATION OF CODES USED IN "NOTES" SECTION: AH - abnormal histology; BR - broken root, cementum missing and no accurate age determination possible; CD - cementum damaged; IN - age determined by inspection, without sectioning; LI - lateral incisor (not standard I1); NE - no envelope with this I.D. number; NP - not processed; NS - not a standard tooth type for age analysis method, accuracy of result uncertain; NTR - no tooth received in envelope; PF - process failure; PR - processed.

JUVENILE AGE CLASS: Identified by "0" in the age column.

ABBREVIATIONS USED FOR SPECIES IDENTIFICATION:

BA	badger	CA	caribou	GB	grizzly bear	MI	mink	RO	river otter
BB	black bear	CO	coyote	GO	mountain goat	ML	mountain lion	SH	mountain sheep
BO	bobcat	EL	elk	MA	marten	MO	moose	WO	wolf
BT	black-tailed deer	FI	fisher	MD	mule deer	PR	pronghorn antelope	WT	white-tailed deer
		FO	fox			RA	raccoon	WV	wolverine

AGE REPORT

By: Gary Matson
Matson's, Box 308, Milltown MT 59851
Phone: (406) 258-6286

Tooth type: Mink canine
Muskrat M1 + mandible

Prepared for: Paul Bovitz Matt Donohue
Roy Weston Inc
Edison NJ
Process code: d
Filename: AD061094-222Y
Date: 10 June 1994

Season of collection: As noted

Species: Mink (3)
Muskrat (13)

"B" RELIABILITY CEMENTUM AGES: THERE IS HISTOLOGICAL EVIDENCE TO SUPPORT THE REPORTED CEMENTUM AGE. IF ERROR IS PRESENT, IT WOULD BE LIKELY WITHIN THE RANGE GIVEN UNDER "NOTES". "C" RELIABILITY CEMENTUM AGES: THERE IS LITTLE HISTOLOGICAL EVIDENCE TO SUPPORT THE REPORTED CEMENTUM AGE, WHICH MIGHT BE WITHIN THE RANGE GIVEN.

MINK CANINE: MATSON'S STANDARDIZED CEMENTUM AGING MODEL WAS USED FOR CEMENTUM AGING. CEMENTUM ANNULI ARE REGULAR AND DISTINCT, AND AGES DETERMINED FROM THEIR COUNT ARE CONSIDERED TO BE HIGHLY ACCURATE.

MINK ASSUMED BIRTHDATE IS 1 APRIL. AGES REPORTED BELOW ARE GIVEN AS IF EACH OF THE 3 ANIMALS HAD PASSED THE ANNUAL BIRTHDAY, EVEN THOUGH 1 TOOTH WAS COLLECTED DURING LATE MARCH.

MUSKRAT ASSUMED BIRTHDATE IS MARCH-SEPT. AGES REPORTED BELOW ARE GIVEN AS IF EACH OF THE MUSKRATS HAD PASSED THE ANNUAL BIRTHDAY.

MUSKRAT MOLAR NUMBER 1: SPECIMEN SECTIONING METHOD. THE TOOTH WAS REMOVED BY CUTTING THE MANDIBLE ON EITHER SIDE OF IT WITH A LAPIDARY SAW. THE RESULTING TISSUE PIECE WAS SECTIONED WITH M1 INTACT IN ITS SOCKET.

MUSKRAT CEMENTUM AGING MODEL. REFERENCE: NOTES GIVEN IN AGE REPORT OF 2 NOVEMBER 1993; PAUL BOVITZ; AGING FILE AM110293-201.

CEMENTUM ANNULI OF M1 HAVE CHARACTERISTICS DIFFERENT FROM THOSE OF OTHER SPECIES. ANNULI ARE POORLY DEFINED, AND APPEAR TO BE COMPLEX (HAVING MORE THAN A SINGLE ANNUAL COMPONENT). NEITHER ACCURACY NOR PRECISION OF CEMENTUM AGES DETERMINED BY COUNTING APPARENT ANNULI IS KNOWN.

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DATA

Species	Date	Tooth/slide ID	Weston ID	Age	CC	Notes
MINK	3-22	1	031994PD360701MK	1	A	
	4-26	2	042694AD060210MK	4	A	
	4-7	3	040794AD160501MK	1	A	
MUSKRAT	2-16	4	021694TB290304MR	1	A	
	3-15	5	031594PD060201MR	1	B	1-2
	3-30	6	033094AD300104MR	4	B	3-5
	3-15	7	031494PD220202MR	2	B	1-3
	3-16	8	031594-150 KALRIV	2	B	1-3
	3-16	9	031594-149 KALRIV	1	B	1-2
	4-6	10	040694-339 KALRIV	1	B	0-2
	4-1	11	040194-226 KALRIV	2	B	1-3
	3-16	12	031594-152 KALRIV	3	B	2-3
	3-16	13	031594-151 KALRIV	1	B	1-2
	4-1	14	040194-228 KALRIV	4	B	3-4
	4-6	15	040694-335 KALRIV	1	B	1-2
	4-1	16	040192-227 KALRIV	2	B	1-2

GENERAL INFORMATION

MATSON'S LABORATORY CEMENTUM AGE ANALYSIS. General Information.

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		FO	fox			RA	raccoon	WV	wolverine